RECORD OF TECHNICAL CHANGE

Technical Change No. CAIP-1 | Page 1 of 2

Project/Job No. IS05-040 | Date 05/24/2005

Project/Job Name CAIP for CAU 219: Septic Systems and Injection Wells, Rev. 0, January 2005

The following technical changes (including justification) are requested by:

David Strand (Name) | Task Manager – Industrial Sites (Title)

Description of Changes:

Section 3.3.3, Page 23, first sentence: Change text from, "…scaled from 25 to 15 millirem…" to "…based on 25 millirem…"; Remove reference "(Appenzeller-Wing, 2004)" from text of sentence.

Table 3-2, Page 24: Change values of 5th column of the table (PAL) to reflect the 25 mrem/year dose exposure values as follows:

Americium-241: from "7.62 pCi/g" to "12.7 pCi/g"'

Cesium-137: from "7.3 pCi/g" to "12.2 pCi/g"

Cobalt-60: from "1.61 pCi/g" to "2.7 pCi/g"

Plutonium-238: from "7.78 pCi/g" to "13 pCi/g"

Plutonium-239/240: from "7.62 pCi/g" to "12.7 pCi/g"

Strontium-90: from "503.0 pCi/g" to "838 pCi/g"

Uranium-234: from "85.9 pCi/g" to "143 pCi/g"

Uranium-235: from "10.5 pCi/g" to "17.5 pCi/g"

Uranium-238: from "63.2 pCi/g" to "105 pCi/g"

Table 3-2 Explanation, Page 24: In superscript "b" explanation, change text from "…scaled from 25 to 15 mrem/yr dose…" to "…based on 25 mrem/yr dose…".

Section A.7.3.3, Page A-34, first line of first paragraph: Change text from, "…scaled from 25- to 15- mrem/yr…" to "…based on 25 mrem/yr…"

Justification:

The Preliminary Action Levels (PALs) values for radiological isotopes in the environment are calculated based on 25 mrem per year exposure level, not 15 mrem per year, as agreed between NNSA/NSO, NDEP and SNJV for the Industrial Sites project.

The project time will be (Increased) (Decreased) (Unchanged) by approximately 0 days.

Applicable Project-Specific Document(s):
Corrective Action Investigation Plan for Corrective Action Unit 219: Septic Systems and Injection Wells, Rev.0, January, 2005

Approved By: Sabine Curtis Date 5-21-05
NNSA/NSO Project Manager

Janet Appenzeller-Wing Date 5/20/05
NNSA/NSO Environmental Restoration Division Director

____________________ Date __________
NDEP

Applicable Project-Specific Document(s):
Corrective Action Investigation Plan for Corrective Action Unit 219: Septic Systems and Injection Wells, Rev.0, January, 2005

Approved By: [signature] **Date** 5-21-05
NNSA/NSO Project Manager

[signature] **Date** 5/20/05
NNSA/NSO Environmental Restoration Division Director

[signature] **Date** 5/20/05
NDEP

Nevada
Environmental
Restoration
Project

DOE/NV--1036

National Nuclear Security Administration

Corrective Action Investigation Plan for Corrective Action Unit 219: Septic Systems and Injection Wells, Nevada Test Site, Nevada

Controlled Copy No.: ___
Revision No.: 0

January 2005

Environmental Restoration
Division

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office

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DOE/NV--1036

CORRECTIVE ACTION INVESTIGATION PLAN FOR CORRECTIVE ACTION UNIT 219: SEPTIC SYSTEMS AND INJECTION WELLS, NEVADA TEST SITE, NEVADA

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office
Las Vegas, Nevada

Controlled Copy No.: ___

Revision No.: 0

January 2005

CORRECTIVE ACTION INVESTIGATION PLAN
FOR CORRECTIVE ACTION UNIT 219:
SEPTIC SYSTEMS AND INJECTION WELLS,
NEVADA TEST SITE, NEVADA

Approved by: Signature Approved Date: 1/24/05

Kevin Cabble, Acting Project Manager
Industrial Sites Project

Approved by: Signature Approved Date: 1/24/05

Janet Appenzeller-Wing, Acting Division Director
Environmental Restoration Division

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Appendix A - Data Quality Objectives

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List of Acronyms and Abbreviations

ASTM	American Society for Testing and Materials
bgs	Below ground surface
BN	Bechtel Nevada
CADD	Corrective Action Decision Document
CAI	Corrective Action Investigation
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Contaminant of concern
COPC	Contaminant of potential concern
CSM	Conceptual site model
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DNA	Defense Nuclear Agency
DQI	Data quality indicator
DQO	Data quality objective
DRO	Diesel-range organics
EPA	U.S. Environmental Protection Agency
EQL	Estimated quantitation limit
FAL	Final action level
FFACO	*Federal Facility Agreement and Consent Order*

Acronyms and Abbreviations *(Continued)*

FSL	Field-screening level
ft	Foot (feet)
FWP	Field Work Permit
GPS	Global positioning system
GRO	Gasoline-range organics
HASP	Health and Safety Plan
HWAA	Hazardous waste accumulation area
IDW	Investigation-derived waste
in.	Inch
IRIS	Integrated Risk Information System
IS HASP	Industrial Sites Health and Safety Plan
ISMS	Integrated Safety Management System
LCS	Laboratory control sample
M&O	Management and Operations
MDC	Minimum detectable concentration
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mi	Mile
mi^2	Square mile
mrem/yr	Millirem per year
MRL	Minimum reporting limit
MS	Matrix spike
MSD	Matrix spike duplicate

Acronyms and Abbreviations (Continued)

NA	Not applicable
NAC	*Nevada Administrative Code*
NCRP	National Council on Radiation Protection and Measurements
ND	Normalized difference
NDEP	Nevada Division of Environmental Protection
NEPA	*National Environmental Policy Act*
NFA	No further action
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NTS	Nevada Test Site
NTSWAC	*Nevada Test Site Waste Acceptance Criteria*
PAL	Preliminary action level
PCB	Polychlorinated biphenyls
pCi/g	Picocuries per gram
pCi/L	Picocuries per liter
PID	Photoionization detector
PPE	Personal protective equipment
ppm	Parts per million
PRG	Preliminary remediation goal
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
RadCon	Radiological control
RCRA	*Resource Conservation and Recovery Act*

Acronyms and Abbreviations (Continued)

RMA	Radioactive materials area
ROTC	Record of Technical Change
RPD	Relative percent difference
SD	Standard deviation
SDG	Sample delivery group
SDWS	*Safe Drinking Water Standards*
SNJV	Stoller-Navarro Joint Venture
SVOC	Semivolatile organic compounds
TCLP	Toxicity characteristic leaching procedure
TPH	Total petroleum hydrocarbon
TSCA	*Toxic Substance Control Act*
UGTA	Underground Test Area
USGS	U.S. Geological Survey
VOC	Volatile organic compound
% R	Percent recovery

Executive Summary

The Corrective Action Investigation Plan for Corrective Action Unit 219, Septic Systems and Injection Wells, has been developed in accordance with the *Federal Facility Agreement and Consent Order* (1996) that was agreed to by the State of Nevada, the U.S. Department of Energy, and the U.S. Department of Defense. The purpose of the investigation is to ensure that adequate data are collected to provide sufficient and reliable information to identify, evaluate, and select technically viable corrective actions.

Corrective Action Unit 219 is located in Areas 3, 16, and 23 of the Nevada Test Site, which is 65 miles northwest of Las Vegas, Nevada. Corrective Action Unit 219 is comprised of the six Corrective Action Sites (CASs) listed below:

- 03-11-01, Steam Pipes and Asbestos Tiles
- 16-04-01, Septic Tanks (3)
- 16-04-02, Distribution Box
- 16-04-03, Sewer Pipes
- 23-20-01, DNA Motor Pool Sewage and Waste System
- 23-20-02, Injection Well

These sites are being investigated because existing information on the nature and extent of potential contamination is insufficient to evaluate and recommend corrective action alternatives. Additional information will be obtained by conducting a corrective action investigation prior to evaluating corrective action alternatives and selecting the appropriate corrective action for each CAS. The results of the field investigation will support a defensible evaluation of viable corrective action alternatives that will be presented in the Corrective Action Decision Document.

The Corrective Action Sites in Areas 3 and 16 were identified in the *Nevada Test Site Inventory of Inactive and Abandoned Facilities and Waste Sites* (REECo, 1991). The two CASs in Area 23 were identified in the *RCRA Part B Permit Application for Waste Management Activities at the Nevada Test Site* (DOE/NV, 1992). The conceptual site model contains the following four release scenarios:

- Leaks from collection features and/or tanks
- Overflows from tanks and/or other CAS-related features
- Leaks from junctions of and/or breaches in subsurface piping
- Discharges at outfalls

The sites will be investigated based on the data quality objectives (DQOs) developed on October 28, 2004, by representatives of the Nevada Division of Environmental Protection; U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office; and contractor representatives. The DQO process was used to identify and define the type, amount, and quality of data needed to develop and evaluate appropriate corrective actions for CAU 219.

Appendix A provides a detailed discussion of the DQO methodology and the DQOs specific to each CAS.

The scope of the corrective action investigation for CAU 219 includes the following activities:

- Remove surface debris.
- Conduct visual surveys at all CASs to identify any staining, discoloration, disturbance of native soils, or any other indication of potential contamination.
- Perform field screenings for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPHs), and fecal coliform (when applicable).
- Conduct video-mole surveys of collection features, tanks, and/or piping to assess physical layout; identify possible residual materials; locate any breaches within features, tanks, and/or piping; and determine whether sources are plugged or sealed, if possible.
- Perform geophysical surveys to locate previously unidentified features.
- Collect and submit environmental samples for laboratory analysis to determine if contaminants of concern (COCs) are present.
- If COCs are present, collect additional step-out samples to define the extent of the contamination.
- Comply with regulatory requirements for waste disposal through the collection and analysis of investigation-derived waste (IDW) samples and conduct inspections and surveys, as needed, to support waste management decisions.
- Collect quality control samples for laboratory analyses to evaluate the performance of measurement systems and controls based on the requirements of the data quality indicators.
- Stake or flag sample locations in the field and record coordinates through global positioning system surveying.

Under the *Federal Facility Agreement and Consent Order*, this Corrective Action Investigation Plan will be submitted to the Nevada Division of Environmental Protection for approval. Field work will be conducted following approval of the plan.

1.0 Introduction

This Corrective Action Investigation Plan (CAIP) contains project-specific information including facility descriptions, environmental sample collection objectives, and criteria for conducting site investigation activities at Corrective Action Unit (CAU) 219: Septic Systems and Injection Wells, Nevada Test Site (NTS), Nevada.

This CAIP has been developed in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) (1996) that was agreed to by the State of Nevada, the U.S. Department of Energy (DOE), and the U.S. Department of Defense (DoD).

Corrective Action Unit 219 is located in Areas 3, 16 and 23 of the NTS, which is approximately 65 miles (mi) northwest of Las Vegas, Nevada (Figure 1-1). Corrective Action Unit 219 is comprised of the six Corrective Action Sites (CASs) shown on Figure 1-1 and listed below:

- 03-11-01, Steam Pipes and Asbestos Tiles
- 16-04-01, Septic Tanks (3)
- 16-04-02, Distribution Box
- 16-04-03, Sewer Pipes
- 23-20-01, DNA Motor Pool Sewage and Waste System
- 23-20-02, Injection Well

The corrective action investigation (CAI) will include field inspections and inventories, video mole surveys, characterization sampling of environmental media, waste management sampling, verification sampling, analysis of samples, and assessment of investigation results, where appropriate. Data will be obtained to support corrective action alternative evaluations and waste management decisions.

1.1 Purpose

The CASs in CAU 219 are being investigated because hazardous and/or radioactive constituents may be present in concentrations that could potentially pose a threat to human health and the environment.

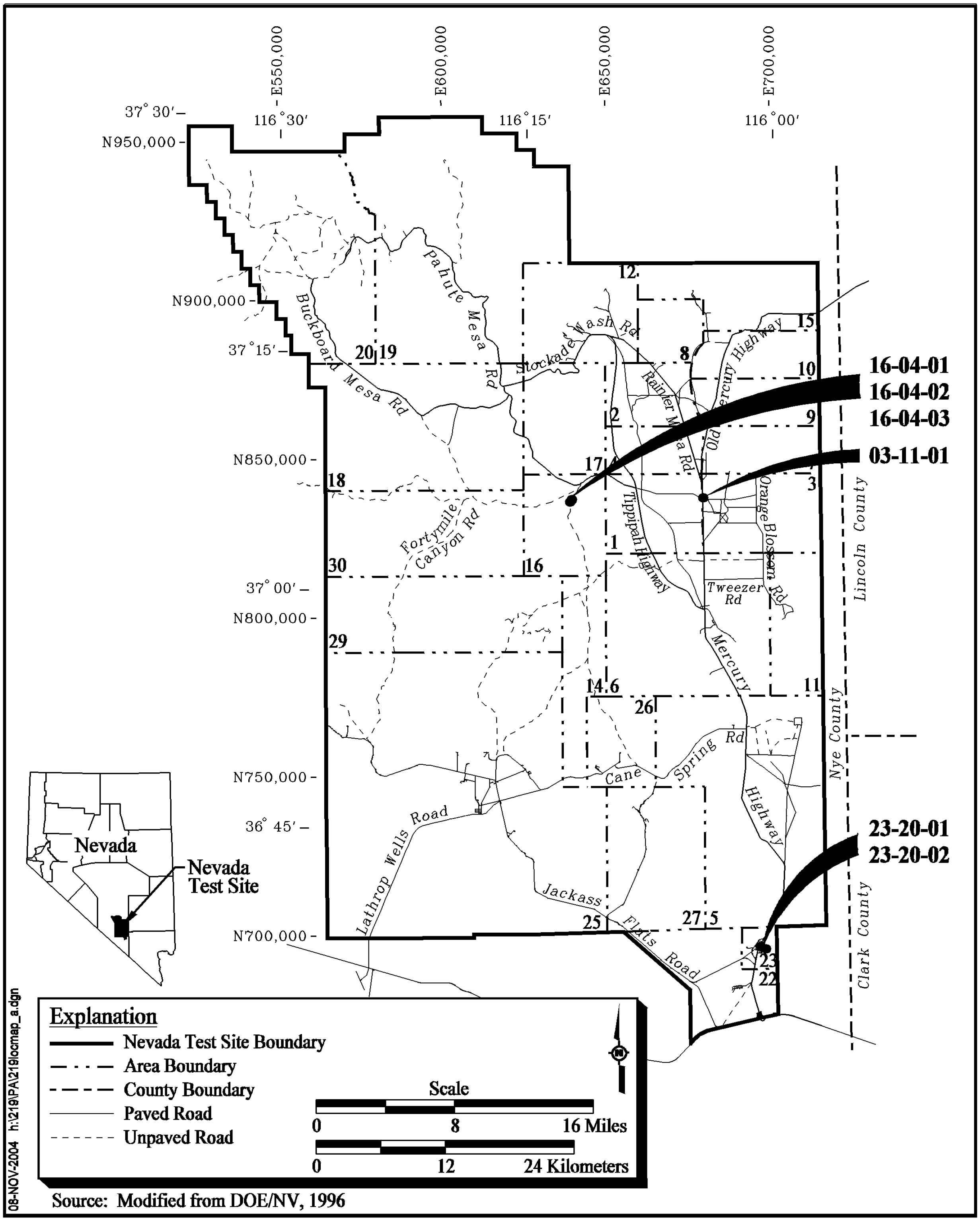

Figure 1-1
Nevada Test Site Map with CAU 219 CAS Locations

1.1.1 CAU History and Description

Corrective Action Unit 219, Septic Systems and Injection Wells, consists of six inactive sites located in Areas 3, 16, and 23. The six CAU 219 sites consist of surface debris, underground piping, a distribution box, septic tanks, grease pits, a catch basin, a floor drain, a sand trap, an oil interceptor, a decontamination pad, a metal battery storage shed, sumps, a drainage channel, an injection well, and surface/subsurface soils beneath and immediately adjacent to these features. The CAU 219 sites were all used to support nuclear testing conducted from the 1950s through the 1970s. Operational histories for each CAU 219 CAS are detailed in Section 2.2.

1.1.2 DQO Summary

The sites will be investigated based on data quality objectives (DQOs) developed by representatives of the Nevada Division of Environmental Protection (NDEP); DOE, National Nuclear Security Administration Nevada Site Office (NNSA/NSO); and contractor representatives. The DQOs are used to identify and define the type, amount, and quality of data needed to develop and evaluate appropriate corrective actions for CAU 219. This CAIP describes the investigative approach developed to collect the data needs identified in the DQO process. While a detailed discussion of the DQO methodology and the DQOs specific to each CAS are presented in Appendix A of this document, a summary of the DQO process is provided below.

The DQO problem statement for CAU 219 is: "Existing information on the nature and extent of potential contamination is insufficient to evaluate and recommend corrective action alternatives for the CASs in CAU 219." To address this question, the resolution of two decisions statements is required:

- Decision I: "Is any contaminant of potential concern (COPC) present in environmental media within the CAS at a concentration exceeding its corresponding action level?" Any contaminant associated with a CAS activity that is present at concentrations exceeding its corresponding action level will be defined as a chemical of concern (COC). If a COC is detected, then Decision II must be resolved. Otherwise, the investigation for that CAS is complete.

- Decision II: "If a COC is present, is sufficient information available to evaluate potential corrective action alternatives?" Sufficient information is defined to include:

  - Identification of the volume of media containing any COC bounded by analytical sample results in lateral and vertical directions.

  - Collection of the information needed to characterize investigation-derived waste (IDW) for disposal.

  - Collection of the information needed to determine potential remediation waste types.

  - Collection of the information needed to evaluate the feasibility of remediation alternatives (bioassessment if natural attenuation or biodegradation is considered and geotechnical data if construction or evaluation of barriers is considered).

For CAS 23-20-02, Injection Well, there is insufficient data available to apply the Decision I statement without first determining the existence of this potential release. Therefore, a third decision statement has been established to address the uncertainty of the existence of this CAS:

- Pre-Decision I: "Does the Injection Well identified as CAS 23-20-02 or any remaining features of the well exist?" Investigative methods will be executed in order to determine the existence, location, and current condition of CAS 23-20-02. If physical evidence of the CAS, the feature itself or residual material, is detected, then Decision I will be resolved. Otherwise, the investigation for that CAS is complete.

The informational inputs and data needs to resolve the problem statement and the decision statements were generated as part of the DQO process for this CAU and are documented in Appendix A. The information necessary to resolve the DQO decisions will be generated for each CAU 219 CAS by collecting and analyzing samples generated during a field investigation. The presence and nature of contamination at each CAS will be determined by sampling locations that are identified as being the most probable to contain COCs if they are present anywhere within each CAS. If while defining the nature of contamination it is determined that COCs are present at a CAS, that CAS will be further addressed by determining the extent of contamination before evaluating corrective action alternatives.

1.2 Scope

To generate information needed to resolve the decision statements identified in the DQO processes, the scope of the CAI for CAU 219 includes the following activities:

- Remove surface debris.
- Conduct visual surveys at all CASs to identify any staining, discoloration, disturbance of native soils, or any other indication of potential contamination.
- Perform field screenings for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPHs), radioactive contamination, and fecal coliform (when applicable).
- Conduct video-mole surveys of collection features, tanks, and/or piping to assess physical layout; identify possible residual materials; locate any breaches within features, tanks, and/or piping; and determine whether sources are plugged or sealed, if possible.
- Perform geophysical surveys to locate previously unidentified features.
- Collect and submit environmental samples for laboratory analysis to determine if COCs are present.
- Collect additional step-out samples if COCs are present to define the extent of the contamination.
- Comply with regulatory requirements for waste disposal through the collection and analysis of IDW samples and conduct inspections and surveys, as needed, to support waste management decisions.
- Collect quality control (QC) samples for laboratory analyses to evaluate the performance of measurement systems and controls based on the requirements of the data quality indicators (DQIs).
- Stake or flag sample locations in the field and record coordinates through global positioning system (GPS) surveying.

Contamination of environmental media originating from activities not identified in the conceptual site model (CSM) of any CAS will not be considered as part of this CAU unless the CSM and the DQOs are modified to include the release. As such, contamination originating from these sources will not be considered for sample location selection, and/or will not be considered COCs for Decision II. If such contamination is present, the contamination will be identified as part of another CAS (either new or existing).

1.3 CAIP Contents

Section 1.0 presents the purpose and scope of this CAIP, while Section 2.0 provides background information about CAU 219. Objectives of the investigation, including a CSM, are presented in Section 3.0. Field investigation and sampling activities are discussed in Section 4.0, and waste management issues for this project are discussed in Section 5.0. General field and laboratory quality assurance (QA) (including collection of QA samples) are presented in Section 6.0 and in the *Industrial Sites Quality Assurance Project Plan* (QAPP) (NNSA/NV, 2002a). The project schedule and records availability are discussed in Section 7.0. Section 8.0 provides a list of references.

Appendix A provides a detailed discussion of the DQO methodology and the DQOs specific to each CAS, while Appendix B contains information on the project organization.

The health and safety aspects of this project are documented in the *Industrial Sites Health and Safety Plan* (IS HASP) and will be supplemented with a site-specific Field Work Permit (FWP) developed prior to the start of field work.

Public involvement activities are documented in the "Public Involvement Plan" contained in Appendix V of the FFACO (1996). The managerial aspects of this project are discussed in the *Project Execution Plan* (DOE/NV, 1994) and will be supplemented with a site-specific field management plan that will be developed prior to field activities.

2.0 Facility Description

Corrective Action Unit 219 is comprised of six CASs that were grouped together based on the geographical location of the sites, technical similarities (subsurface components of a discharge system), and the agency responsible for closure. Three CASs (16-04-01, 16-04-02, and 16-04-03) are the components of a septic system. One CAS (23-20-01) is a waste and sanitary sewage system. One CAS (23-20-02) is an injection well, and one CAS (03-11-01) is surface debris in close proximity to previously investigated injection wells. Descriptions of and figures for each of the CASs are presented in Appendix A.

2.1 Physical Setting

The following sections describe the general physical settings of Areas 3, 16, and 23 of the NTS. General background information pertaining to topography, geology, hydrogeology, and climatology are provided for these specific areas or the NTS region in the *Geologic Map of the Nevada Test Site, Southern Nevada* (USGS, 1990)**;** *CERCLA Preliminary Assessment for DOE's Nevada Operations Office Nuclear Weapons Testing Areas* (DRI, 1988); the *Nevada Test Site Final Environmental Impact Statement* (ERDA, 1977); and the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996).

The NTS lies in the southern part of the Great Basin section of the Basin and Range physiographic province (USGS, 1996). The topography of this province consists of numerous north-south trending, linear mountain ranges separated by broad, flat-floored and gently-sloped valleys (DOE/NV, 1993). The general geology of the NTS consists primarily of three major geologic units. The oldest units are complexly folded and faulted Paleozoic units composed mainly of carbonate rocks (limestone and dolomite), separated by a middle section of siliciclastic rocks (shale and quartzite). Tertiary age volcanic tuffs and lavas overlay the Paleozoic units in many places. The valleys are covered with Tertiary and Quarternary age alluvial and colluvial deposits that have been eroded from the surrounding mountain ranges (ERDA, 1977).

The NTS lies within the Death Valley ground-water flow system. The Death Valley flow system covers an approximate area of 15,800 square miles (mi^2) of the southern Great Basin. The flow system consists of volcanic rock in the west and carbonate rock in the east and is estimated to transmit more than 70,000 acre-feet (ft) of groundwater annually. The region is characterized by low rainfall, intermittent streams, internal surface drainages, and large, sparsely-distributed springs (ERDA, 1977).

2.1.1 Area 3

Corrective Action Site 03-11-01 is located on the western side of Area 3 within the intermontane basin of Yucca Flat. This valley is slowly being filled with alluvial deposits eroding from the surrounding foothills (Laczniak et al., 1996). The average thickness of alluvium in Yucca Flat is approximately 1,000 ft, but can be as thick as 6,500 ft in some places (LLNL, 1982).

The average annual precipitation rate in Area 3 is approximately 6.62 inches (in.) (ARL/SORD, 2003). The closest well to the site, U.S. Geological Survey (USGS) Water Well A, is located approximately 1.2 mi southeast of the site. It is saturated below 1,610 ft (USGS, 1961; Wuellner, 1994). Transpiration rates at CAS 03-11-01 are unknown.

2.1.2 Area 16

Parts of CASs 16-04-01, 16-04-02, and 16-04-03 lie in the Shoshone Mountain Range. The sites consist of Tertiary volcanic deposits and clasts that have eroded from the surrounding Timber Mountain caldera and Shoshone Mountain (USGS, 1965). The area also contains clastic sediments and some carbonate rocks (DOE/NV, 1996). The thickness of the alluvium is unknown at this site.

The closest well to the site is USGS Water Well UE-16f which is located approximately 10,500 ft southeast of the CASs. The well was drilled to a depth of 1,479 ft, penetrating only alluvial material. The water level is 367 ft below ground surface (bgs).

2.1.3 Area 23

Corrective Action Sites 23-20-01 and 23-20-02 are located within the Mercury Valley. The quaternary alluvium found in Mercury Valley (Area 23) is approximately 1,200 ft thick and is underlain by the Paleozoic lower carbonate aquifer and the Ash Meadows groundwater basin. The soil in Mercury Valley is typical desert alluvium composed of mostly fine soil and rock particles and includes loose rocks measuring up to 3 in. in diameter.

The average annual precipitation rate at the Mercury gauging station is approximately 5.59 in. (DRI, 1988). The closest water well, Army #1 WW, is located approximately 5 mi to the southwest of Mercury and is the main potable well for the area. The depth to groundwater at Army #1 WW is 785 ft bgs as measured for a landfill operating permit (BN, 1997).

2.2 Operational History

The following subsections provide a description of the use and history of each CAS in CAU 219 that may have resulted in potential releases to the environment. The CAS-specific summaries are designed to describe the current definition of each CAS and illustrate all significant, known activities.

2.2.1 CAS 03-11-01, Steam Pipes and Asbestos Tiles

Corrective Action Site 03-11-01 consists of potential releases from surface debris within the former Area 3 Subdock. This debris includes four pieces of steam pipe and 9- x 9-in. floor tiles attached to the northern end of the concrete pad and scattered on the surface soil. The four pieces of steam pipe are wrapped with fiberglass insulation, are approximately 4 in. in diameter, and range in length. Three of the four are located near the concrete pad with one attached to a 15-ft hose. The fourth piece is located near the Pipe Straightening Shed to the northwest. These steam pipe remnants are most likely associated with a water tank that once serviced the Steam Plant and Pipe Straightening Shed. Figure A.2-1 shows a site sketch of the CAS.

The Area 3 Subdock Complex was in operation from the 1970s through 1985 when it was relocated to Area 1. The Steam Plant was used for the steam cleaning of drilling pipe, bits, and other drilling related equipment. Bent drilling pipe was straightened at the Pipe Straightening Shed, which is located northwest of the Steam Plant (Patton, 2003). Although all of the buildings at the Subdock have been removed, many of the concrete foundations still remain. None of the known activities at the site would have resulted in the contamination of the steam pipes of floor tiles.

2.2.2 CASs 16-04-01, Septic Tanks (3); 16-04-02, Distribution Box; and 16-04-03, Sewer Pipes

Corrective Action Sites 16-04-01, 16-04-02, and 16-04-03 are the potential releases of contaminants from the components of the former Area 16 Camp septic system. This system contains associated underground sewer piping (CAS 16-04-03), a distribution box (CAS 16-04-02), three septic tanks (CAS 16-04-01), a drainage channel, and a sump excavation. The sewer piping originates from the Area 16 Camp trailer park located to the south and up gradient of the access road. The pipes converge north of the access road at a concrete manhole and continue north to a distribution box where they are split back into three pipes, each flowing north into one of three separate septic tanks (Holmes & Narver, 1970). Each tank is partly visible at the ground surface and has an effluent pipe heading north. These pipes converge and empty into a drainage channel north and down gradient of the tanks. The drainage channel opens into the sump excavation to the west. Figure A.2-2 and Figure A.2-3 show the components of each CAS.

Corrective Action Sites 16-04-01, 16-04-02, and 16-04-03 serviced the former Area 16 Camp. The camp was set up in the early 1960s to house the Area 16 tunnel workers (Metcalf, 2004). These facilities were residential in nature and included 52 residential trailers, two dining trailers, a kitchen trailer, a recreation trailer, and two shower trailers. The camp was dismantled sometime between the mid 1960s and 1972 and there are currently no buildings or foundations remaining in the Area 16 Camp (Neagle, 2004). Industrial activities are not reported within the Area 16 Camp and there are no indications that the septic system was used for anything other than sanitary waste.

2.2.3 CAS 23-20-01, DNA Motor Pool Sewage and Waste System

Corrective Action Site 23-20-01 consists of the potential releases from the interconnected sanitary sewage and waste systems associated with the former Building 210, the Defense Nuclear Agency (DNA) Motor Pool facility. Components of this CAS include two grease pits, a catch basin, a floor drain, a sand trap, an oil interceptor, a decontamination pad, a metal battery storage shed, underground piping, a sump, and debris (floor tiles). The grease pits, catch basin, and floor drain are located in the foundation of Building 210. The sand trap and sump are located in and below the decontamination pad, which is adjacent to the northern edge of the Building 210 pad. The oil interceptor is located west of the decontamination pad and connected to the same piping system as the other waste features and the sanitary sewage system. The piping system flowed north to the active piping associated with Building 211 and eventually discharged into the Mercury Sewage Lagoons. The metal battery storage shed is still standing and is adjacent to the eastern edge of the decontamination pad (REECo, 1958). Figure A.2-4 shows the site components of the CAS as described above.

Former Building 210 was built in 1952 and was used for vehicle maintenance activities until 1991 when it became a storage facility for nonhazardous waste (Olsen, 2004). The building housed sanitary facilities including a drinking fountain, two lavatories, a urinal, and a toilet. The building was demolished in 2001, leaving behind the concrete slab, subsurface waste collection features, decontamination pad, and metal battery storage shed. The site is currently inactive and abandoned (Olsen, 2004).

2.2.4 CAS 23-20-02, Injection Well

Corrective Action Site 23-20-02 consists of the potential releases from an injection well located in or near the western corner of former Building 132. The injection well was not identified during the preliminary assessment field investigation. Since former Building 132 and its foundation have been demolished and converted into a parking lot, it is uncertain if the injection well still physically exists or if it was removed during demolition. Figure A.2-5 shows a site sketch of the area most likely to contain the CAS.

Former Building 132 was the REECo Motor Pool. It was built in 1952 and used for vehicle maintenance activities (Olsen, 2004). In 1965, the motor pool moved to its current location and former Building 132 was demolished (Gonzalez, 2004). The former Building 132 foundation is no longer present, and the site is currently an active parking lot and storage yard south of the Building 160 warehouse.

2.3 Waste Inventory

Available documentation, interviews with former site employees, process knowledge, and general historical NTS practices were used to identify wastes that may be present. Historical information and site visits indicate that the sites contain wastes such as construction materials, equipment, asbestos, and other miscellaneous debris.

2.3.1 CAS 03-11-01, Steam Pipes and Asbestos Tiles

The solid waste items identified at CAS 03-11-01 are nonhazardous and nonradioactive. They include asbestos-containing floor tiles, abandoned pipe pieces, pipe insulation, a rubber hose, miscellaneous metal debris, and residual waste that may be present in the pipe pieces and/or hose.

2.3.2 CASs 16-04-01, Septic Tanks (3); 16-04-02, Distribution Box; and 16-04-03, Sewer Pipes

The solid waste items at CASs 16-04-01, 16-04-02, and 16-04-03 are potentially hazardous and radioactive. These items may include residual sludge that exists in the septic tanks, distribution box, and/or sewer piping. Hazardous and/or radioactive wastes may be present in the surface and/or subsurface soils located at and down gradient from the outfall and in the surface and/or subsurface soils that are beneath and immediately adjacent to the septic system components as a result of potential breaches and/or overflows. The nature of a residential sewage system would suggest the potential for sanitary waste. Negligible amounts of miscellaneous debris exist in the immediate vicinity of the septic system.

2.3.3 CAS 23-20-01, DNA Motor Pool Sewage and Waste System

Solid waste items identified at CAS 23-20-01 are potentially hazardous and radioactive. These items include an abandoned metal cage, the metal battery storage shed, and any residual sludge that may exist in any of the collection features and/or underground piping. Hazardous and/or radioactive wastes may be present in the surface and/or subsurface soils that are beneath and immediately adjacent to these collection features and underground piping as a result of potential breaches and in the surface and/or subsurface soils directly adjacent to the concrete pad, decontamination pad, and metal battery storage shed as a result of run-off. The nature of the facility as a motor pool would suggest the potential for residual petroleum hydrocarbons, solvents, coolants, and/or metals.

2.3.4 CAS 23-20-02, Injection Well

Solid waste items at CAS 23-20-02 may include residual sludge within the injection well, if the well does indeed exist. Hazardous and/or radioactive wastes may be present in the surface and/or subsurface soils beneath and immediately adjacent to the well and any associated underground piping as a result of potential breaches. The nature of the facility as a motor pool would suggest the potential for residual petroleum hydrocarbons, solvents, coolants, and/or metals. Negligible amounts of miscellaneous debris exist in the vicinity most likely to contain the injection well.

2.4 Release Information

Process knowledge and historical information provides no evidence of releases occurring at any of the CASs. Potentially affected media for all CASs include surface and/or shallow subsurface soils immediately surrounding CAS features, concrete from the distribution box, sewer piping, and debris. Exposure routes to site workers include ingestion, inhalation, and/or dermal contact (absorption) from disturbance of contaminated soils, debris, structures, and asbestos-containing materials. Site workers may also be exposed to radiation by performing activities in proximity to radiologically contaminated materials.

The following subsections contain CAS-specific descriptions of known or potential releases associated with CAU 219.

2.4.1 CAS 03-11-01, Steam Pipes and Asbestos Tiles

There is no reason to suspect that any equipment, materials, or operations associated with this CAS released any contamination to surrounding environmental media.

2.4.2 CASs 16-04-01, Septic Tanks (3); 16-04-02, Distribution Box; and 16-04-03, Sewer Pipes

Based on historical information and process knowledge, the primary source of potential contamination released to surrounding soils at these CASs is from the effluent of the former Area 16 Camp septic system. Contaminants may have potentially been released at leaks in the distribution box and tanks, from septic tank overflows, at breaches in and junctions of the piping, and/or by discharges at the outfall. There are no known documented releases identified for this CAS.

2.4.3 CAS 23-20-01, DNA Motor Pool Sewage and Waste System

Based on historical information and process knowledge, the primary source of potential contamination released to surrounding soils at CAS 23-20-01 is from the effluent of the sanitary sewage and waste systems. Contaminants may have potentially been released by surface run-off at the pad, at leaks in the collection features, from collection feature overflows, and/or at breaches in and junctions of the piping. There are no known documented releases identified for this CAS.

2.4.4 CAS 23-20-02, Injection Well

Historical documentation reports that this feature was a disposal unit that potentially received wastes from the former Building 132 Motor Pool; however, no known documented releases have been identified for this CAS. Contaminants may have been potentially released at leaks in the injection well and/or at breaches in and junctions of any associated piping.

2.5 Investigative Background

The following subsections summarize the investigations conducted at the CAU 219 sites. More detailed discussions of these investigations are found in Appendix A.

2.5.1 CAS 03-11-01, Steam Pipes and Asbestos Tiles

The tiles, piping insulation, and surrounding soil have been previously sampled and analyzed for asbestos. Asbestos was not found to be present in either the piping insulation or the surrounding soils; however, the analytical results did confirm 10 to 20 percent chrysotile asbestos in the floor tiles (DataChem, 2004a). Geophysical surveys confirmed the presence of underground water piping (Fahringer, 2004), and radiological surveys identified no areas of elevated radiological activity (Alderson, 2004).

2.5.2 CASs 16-04-01, Septic Tanks (3); 16-04-02, Distribution Box; and 16-04-03, Sewer Pipes

There are no known analytical results for these CASs. The presence of the tanks and associated underground piping was confirmed during geophysical surveys conducted at these sites

(Fahringer, 2004), and radiological surveys identified no areas of elevated radiological activity (Alderson, 2004).

2.5.3 CAS 23-20-01, DNA Motor Pool Sewage and Waste System

Interviews indicate that sludge samples from the catch basin were collected and analyzed in 1993. Although no data is available, the interviewee recalls that the results indicated the presence of hazardous materials in the sludge (Boehlecke, 2004). Asbestos was not found in the surrounding soils; however, the analytical results did confirm 10 to 20 percent chrysotile asbestos in the floor tiles (DataChem, 2004b). The results of a geophysical survey confirm the presence of the various components and underground piping (Fahringer, 2004), and radiological surveys identified no areas of elevated radioactivity (Alderson, 2004).

2.5.4 CAS 23-20-02, Injection Well

No analytical results exist for the injection well or the former Building 132. Geophysical surveys were conducted but the CAS feature was not identified (Fahringer, 2004). Radiological surveys identified no areas of elevated radioactivity (Alderson, 2004). Further geophysical surveys will be performed outside of the original perimeter to determine the presence or absence of the injection well.

2.5.5 National Environmental Policy Act

The *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996) includes site investigation activities such as those proposed for CAU 219.

In accordance with the NNSA/NSO *National Environmental Policy Act* (NEPA) Compliance Program, a NEPA checklist will be completed prior to commencement of site investigation activities at CAU 219. This checklist requires NNSA/NSO project personnel to evaluate their proposed project activities against a list of potential impacts that include, but are not limited to: air quality, chemical use, waste generation, noise level, and land use. Completion of the checklist results in a determination of the appropriate level of NEPA documentation by the NNSA/NSO NEPA Compliance Officer. This will be accomplished prior to mobilization for the field investigation.

3.0 Objectives

This section presents an overview of the DQOs for CAU 219 and formulation of the CSM. Also presented is a summary listing of the contaminants reasonably suspected to be present at each CAS, the COPCs, the action levels for the investigation, and the process used to move from preliminary action levels (PALs) to final action levels (FALs). Additional details and figures depicting the CSM are located in Appendix A.

3.1 Conceptual Site Model

The CSM (Figure 3-1) describes the most probable scenario for current conditions at each site and defines the assumptions that are the basis for identifying the future land use, contaminant sources, release mechanisms, migration pathways, exposure points, and exposure routes. The CSM is also used to support appropriate sampling strategies and data collection methods. The CSM was developed for CAU 219 using information from the physical setting, potential contaminant sources, release information, historical background information, knowledge from similar sites, and physical and chemical properties of the potentially affected media and COPCs. In particular, the CSM illustrates the collection and distribution features typical of the CAU. Section A.3.2 of Appendix A provides more detailed information on the CSM as presented for DQO formulation.

If evidence of potential contamination that is outside the scope of the presented CSM is identified during investigation activities, the situation will be reviewed and a recommendation will be made as to how best to proceed. In such cases, decision makers listed in Section A.3.1 will be notified and given the opportunity to comment on and/or concur with the recommendation.

For CAS 03-11-01, Steam Pipes and Asbestos Tiles, no CSM is applicable since the surface debris at this location will be removed in accordance with a housekeeping work plan.

The following sections discuss future land use and the identification of exposure pathways (i.e., combination of source, release, migration, exposure point, and receptor exposure route) for the CAU.

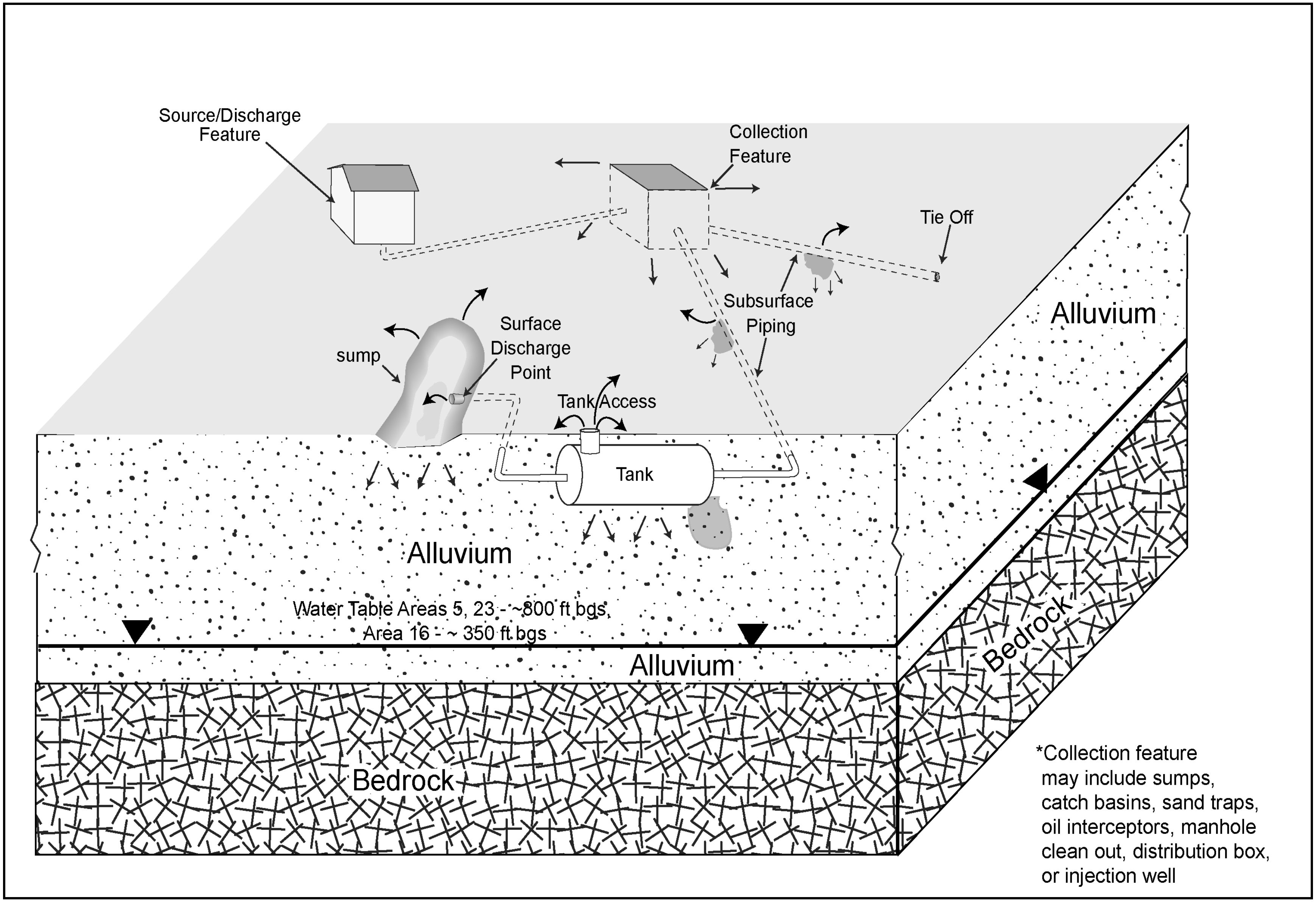

Figure 3-1
Collection and Distribution Feature CSM

3.1.1 Future Land Use

Corrective Action Sites 03-11-01, 16-04-01, 16-04-02, and 16-04-03 are located in the land-use zone described as the "Nuclear and High Explosive Test Zone" (DOE/NV, 1998). This area is designated within the Nuclear Test Zone for additional underground nuclear weapons tests and outdoor high explosives tests. This zone includes compatible defense and nondefense research, development, and testing activities. The Nuclear Test Zone is reserved for dynamic experiments, hydrodynamic tests, and underground nuclear weapons and weapons effects tests (DOE/NV, 1998).

Corrective Action Sites 23-20-01 and 23-20-02 are located in the land-use zone described as "Reserved" within the NTS. This area includes land and facilities that provide widespread flexible support for diverse short-term testing and experimentation. The reserved zone is also used for short-duration exercises and training such as nuclear emergency response, Federal Radiological Monitoring and Assessment Center training, and DoD land-navigation exercises and training (DOE/NV, 1998)

All land-use zones where the CAU 219 CASs are located dictate that future land uses will be limited to nonresidential (i.e., industrial) activities.

3.1.2 Contaminant Sources

The primary contaminant sources are discussed in Section 2.4 and include the materials potentially released and the processes by which they were released.

3.1.3 Release Mechanisms

Release of contamination would be attributed to:

- Leaks from collection features and/or tanks
- Overflow from tanks and/or other CAS-related features
- Leaks from junctions of and/or breaches in subsurface piping
- Discharge at outfalls

3.1.4 Migration Pathways

An important element of the CSM in developing a sampling strategy is the expected transport of contaminants (how contaminants migrate through media and where they can be expected in the environment). Transport of contaminants is presented in the CSM as the migration pathways and transport mechanisms that could potentially move the contaminants throughout the various media. Transport is influenced by physical and chemical characteristics of the contaminants and media. Contaminant characteristics include, but are not limited to: solubility, density, and adsorption potential. Media characteristics include permeability, porosity, water saturation, sorting, chemical composition, and organic content. In general, contaminants with low solubility, high affinity for media, and high density can be expected to be found relatively close to release points. Contaminants with high solubility, low affinity for media, and low density can be expected to be found further from release points. These factors affect the migration pathways and potential exposure points for the contaminants in the various media under consideration.

Infiltration and percolation of precipitation serves as a driving force for downward migration of contaminants. However, due to high evapotranspiration (annual potential evapotranspiration at the Area 3 Radiological Waste Management Site has been estimated at 62.6 in. [Shott et al., 1997]) and limited precipitation for this region (6 to 12 in. per year [Winograd and Thordarson, 1975]), percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992).

The degree of contaminant migration at CAU 219 is unknown but is expected to be minimal based on the affinity of the COPCs for soil particles, and the low precipitation and high evapotranspiration rates typical of the NTS environment. The migration pathways for the CASs containing a tank and/or drainage channel (16-04-01, 16-04-02, 16-04-03) may have experienced lateral migration if overflow or washout occurred. The migration pathways for the remaining CAS features are expected to be generally limited to vertical migration of contaminants beneath and immediately adjacent to these features due to the limited precipitation.

Contamination, if present, is expected to be contiguous to the release site. For subsurface migration and surface migration without scouring, it would be expected that contaminant levels decrease with horizontal and vertical distance from the point of release.

3.1.5 Exposure Points

Exposure points for the CSM are expected to be areas of surface contamination where visitors and site workers will come in contact with surface soils. Subsurface exposure points may also exist if construction workers come in contact with contaminated media during excavation activities. Site workers may also be exposed to radiation by performing activities in proximity to radiologically contaminated materials.

3.1.6 Exposure Routes

Exposure routes to site workers include ingestion, inhalation, and/or dermal contact (absorption) from disturbance of, or direct contact with, contaminated media.

3.1.7 Additional Information

Information concerning topography, geology, climatic conditions, hydrogeology, floodplains, and infrastructure at the CAU 219 CASs are available and are presented in Section 2.1 as they pertain to the investigation. This information has been addressed in the CSM and will be considered during the evaluation of corrective action alternatives, as applicable. General surface and subsurface soil descriptions as well as specific structure descriptions will be observed and recorded during the CAI.

3.2 Contaminants of Potential Concern

The COPCs for CAU 219 are defined as the comprehensive list of constituents identified in Table 3-1 for which analytical results will be requested from Decision I environmental samples taken at each of the CASs. In some cases (for the purpose of brevity) the COPCs are identified as analytical methods. In these instances, all of the analytes reported from these analytical methods are considered COPCs. The list of COPCs is intended to encompass all of the contaminants that could potentially be present at each CAS. These COPCs were identified during the planning process through the review of site history, process knowledge, personal interviews, past investigation efforts (where available), and inferred activities associated with the CASs. Contaminants detected at other similar or other NTS sites were also included in the COPC list to reduce the uncertainty about potential contamination at the CASs because complete information regarding activities performed at the CAU 219 sites is not available.

Table 3-1
Analytical Program[a]
(Includes Waste Characterization Analyses)

Analyses[b]	CAS 03-11-01	CASs 16-04-01, 16-04-02, and 16-04-03	CAS 23-20-01	CAS 23-20-02
Organic COPCs				
TPH (Diesel-Range Organics) by 8015	---	X	X	X
TPH (Gasoline-Range Organics) by 8015	---	X	X	X
Polychlorinated Biphenyls (PCBs) by 8082[e]	---	X	X	X
Ethylene Glycol by 8015	---	---	X	X
Semivolatile Organic Compounds by 8270[c]	---	X	X	X
Volatile Organic Compounds by 8260[c]	---	X	X	X
Inorganic COPCs				
Total *Resource Conservation and Recovery Act* Metals by 6010[c]	X[f]	X	X	X
Total Beryllium by 6010[e]	---	X	X	X
Total Lithium by 6010	---	---	X	---
Total Nickel by 6010	---	---	X	---
Radionuclide COPCs				
Gamma Spectrometry[d]	X[f]	X	X	X
Waste Characterization Analyses				
Asbestos	X	---	X	---

X - Required analytical method

[a]The contaminants of potential concern are the analytes reported from the analytical methods listed.
[b]If the volume of material is limited, prioritization of the analyses will be necessary.
[c]May also include toxicity characteristic leaching procedure analytes if sample is collected for waste management purposes.
[d]Results of gamma analysis will be used to determine if further radioanalytical analysis is warranted.
[e]Analytical methods are listed for CAU 219 because they are considered to be common NTS concerns.
[f] Verification samples collected below housekeeping waste will be submitted for total RCRA metals and gamma spectrometry only.

* Based on available process knowledge, no target analytes are listed.

Organic and inorganic analytes reported from the analytical methods listed in Table 3-1 for which the U.S. Environmental Protection Agency (EPA) Region 9 has established Preliminary Remediation Goals (PRGs) (EPA, 2002) or for which toxicity data are listed in the EPA Integrated Risk Information System (IRIS) database (EPA, 2001b) are considered to be COPCs. Radiological COPCs are defined as the radionuclides reported from the analytical methods listed in Table 3-1.

After review of site history documentation, process knowledge information, personal interviews, and inferred activities associated with the CASs, none of the COPCs were identified as targeted analytes at specific CASs. Targeted analytes are those COPCs for which evidence in the available site and process information suggests that they may be reasonably suspected to be present at a given CAS. The targeted analytes are required to meet a more stringent completeness criteria than other COPCs thus providing greater protection against a decision error (see Section A.8.0). If at some point during the CAI the existence of a COC in environmental media is confirmed through analytical methods, then that contaminant will be identified as a target analyte.

3.3 Preliminary Action Levels

The PALs presented in this section are to be used for site-screening purposes. They are not necessarily intended to be used as clean-up action levels or FALs. However, they are useful in screening out analytes that are not present in sufficient concentrations to warrant further evaluation; therefore, streamline the consideration of remedial alternatives. The process that will be used to move from PALs to FALs is to:

- Establish FALs that are equal to the PALs
- Establish FALs based on risk to human health and the environment.

The determination of FALs will be documented in the investigation report. If FALs are used that are not equal to the PALs, the derivation of the FALs will be presented in an appendix to the investigation report.

At a given CAS, each COPC that is detected in a sample at concentrations exceeding the corresponding FAL becomes a COC. The comparison of laboratory results to action levels and the evaluation of potential corrective actions will be included in the investigation report.

3.3.1 Chemical PALs

Except as noted herein, the chemical PALs are defined as the EPA Region 9 risk-based PRGs for chemical constituents in industrial soils (EPA, 2002). Background concentrations for *Resource Conservation and Recovery Act* metals, beryllium, lithium, and nickel will be used instead of PRGs when natural background concentrations exceed the PRG, as is often the case with arsenic on the NTS. Background is considered the mean plus two standard deviations of the mean for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999). For detected chemical COPCs without established PRGs that are listed in the EPA IRIS database (EPA, 2001b), the protocol used by the EPA Region 9 in establishing PRGs (or similar) will be used to establish PALs. If used, this process will be documented in the investigation report.

3.3.2 Total Petroleum Hydrocarbon PALs

The PAL for TPH is the action limit in soil of 100 parts per million (ppm) per the *Nevada Administrative Code* (NAC) 445A.2272, “Contamination of Soil: Establishment of Action Levels” (NAC, 2003).

3.3.3 Radionuclide PALs

The PALs for radiological contaminants (other than tritium) are based on the National Council on Radiation Protection and Measurements (NCRP) Report No. 129 recommended screening limits for construction, commercial, industrial land-use scenarios (NCRP, 1999) scaled from 25 to 15 millirem per year (mrem/yr) dose constraint (Appenzeller-Wing, 2004) and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993). These PALs are based on the construction, commercial, industrial land-use scenario provided in the guidance and are appropriate for the NTS based on future land-use scenarios as presented in Section 3.1.1. The PAL for tritium is based on the Underground Test Area (UGTA) Project limit of 400,000 picocuries per liter (pCi/L) for discharge of water containing tritium to an infiltration basin/area (NNSA/NV, 2002b). The activity of tritium in the soil moisture of soil samples will be reported in units of pCi/L for comparison to this PAL. The radiological PALs for CAU 219 are listed in Table 3-2.

Table 3-2
Analytical Requirements for Radionuclides for CAU 219

Parameter/Analyte	Matrix	Analytical Method	MDC[a]	PAL[b,c]	Laboratory Precision (RPD)	Percent Recovery (%R)
Gamma Spectrometry						
Americium-241	soil	HASL-300[f]	2.0 pCi/g[e]	7.62 pCi/g	Relative Percent Difference (RPD) 35% Normalized Difference -2<ND<2[g]	Laboratory Control Sample Recovery 80-120[h] Percent Recovery (%R)
Cesium-137	soil	HASL-300[f]	0.5 pCi/g[e]	7.3 pCi/g		
Cobalt-60	soil	HASL-300[f]	0.5 pCi/g[e]	1.61 pCi/g		
Other Radionuclides (If further radioanalytical analysis is warranted)						
Tritium	soil	lab specific	400 pCi/L[d]	4.0E+05 pCi/L[d]	Relative Percent Difference (RPD) 35% Normalized Difference -2<ND<2[g]	Laboratory Control Sample Recovery 80-120[h] Percent Recovery (%R) Chemical Yield 30-105[j] %R
Plutonium-238	soil	ASTM C1001-00[k]	0.05 pCi/g	7.78 pCi/g		
Plutonium-239/240	soil	ASTM C1001-00[k]	0.05 pCi/g	7.62 pCi/g		
Strontium-90	soil	HASL 300[f]	0.5 pCi/g	503.0 pCi/g		
Uranium-234	soil	ASTM C1000-02[m]	0.05 pCi/g	85.9 pCi/g		
Uranium-235	soil	ASTM C1000-02[m]	0.05 pCi/g	10.5 pCi/g		
Uranium-238	soil	ASTM C1000-02[m]	0.05 pCi/g	63.2 pCi/g		

[a]The MDC is the lowest concentration of a radionuclide, if present in a sample, that can be detected with a 95 percent confidence level.
[b]The PALs for soil are based on the NCRP Report No. 129; *Recommended Screening Limits for Contaminated Soil and Review of Factors Relevant to Site-Specific Studies* (NCRP, 1999) scaled from 25 to 15 mrem/yr dose and the guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993).
[c]PALs for liquids will be developed as needed.
[d]Units of pCi/L will be reported by the analytical laboratory based on the activity of the tritium in the soil moisture. The PAL for tritium in soil is based on the UGTA Project limit of 400,000 pCi/L for discharge of water containing tritium to an infiltration basin/area (NNSA/NV, 2002b).
[e]MDCs vary depending on the presence of other gamma-emitting radionuclides in the sample and are relative to the MDC for cesium-137.
[f]*The Procedures Manual of the Environmental Measurements Laboratory*, HASL-300 (DOE, 1997)
[g] ND is not RPD, it is another measure of precision used to evaluate duplicate analyses. The ND is calculated as the difference between two results divided by the square root of the sum of the squares of their total propagated uncertainties. *Evaluation of Radiochemical Data Usability* (Paar and Porterfield, 1997)
[h]EPA *Contract Laboratory Program Statement of Work for Inorganic Analysis* (EPA, 1988a; 1994a; and 1995)
[i]*Standard Test Method for Plutonium in Water* (ASTM, 2002b)
[j] General Radiochemistry and Routine Analytical Services Protocol (GRASP) (EG&G Rocky Flats, 1991). The chemical yield only applies to plutonium, uranium and strontium.
[k]*Standard Test Method for Radiochemical Determination of Plutonium in Soil by Alpha Spectroscopy* (ASTM, 2000a)
[l]*Standard Test Method for Isotopic Uranium in Water by Radiochemistry* (ASTM, 2002a)
[m]*Standard Test Method for Radiochemical Determination of Uranium Isotopes in Soil by Alpha Spectrometry* (ASTM, 2002c)
[n]*Standard Test Method for Strontium-90 in Water* (ASTM, 2000b).

ASTM = American Society for Testing and Materials
MDC = Minimum detectable concentration
ND = Normalized difference
PAL = Preliminary action level
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter

Solid media such as concrete and/or structures may pose a potential radiological exposure risk to site workers if contaminated. The radiological PAL for solid media will be defined as the unrestricted-release criteria defined in the *NV/YMP Radiological Control* (RadCon) *Manual* (DOE/NV, 2000a).

3.4 DQO Process Discussion

This section contains a summary of the DQO process that is presented in Appendix A. The DQO process is a strategic planning approach based on the scientific method that is designed to ensure that the data collected will provide sufficient and reliable information to identify, evaluate, and technically defend the recommendation of viable corrective actions (e.g., no further action, clean closure, or closure in place).

The DQO strategy for CAU 219 was developed at a meeting on October 28, 2004. The DQOs were developed to identify data needs, clearly define the intended use of the environmental data, and to design a data collection program that will satisfy these purposes. During the DQO discussions for this CAU, the informational inputs or data needs to resolve problem statements and decision statements were documented.

The problem statement for CAU 219 is: "Existing information on the nature and extent of potential contamination is insufficient to evaluate and recommend corrective action alternatives for the CASs in CAU 219." To address this question, the resolution of two decisions statements is required:

- Decision I: "Is any COPC present in environmental media within the CAS at a concentration exceeding its corresponding action level?" Any contaminant associated with a CAS activity that is present at concentrations exceeding its corresponding action level will be defined as a COC. If a COC is detected, then Decision II must be resolved. Otherwise, the investigation for that CAS is complete.

- Decision II: "If a COC is present, is sufficient information available to evaluate potential corrective action alternatives?" Sufficient information is defined to include:

  - Identification of the volume of media containing any COC bounded by analytical sample results in lateral and vertical directions.

  - Collection of the information needed to characterize IDW for disposal.

- Collection of the information needed to determine potential remediation waste types.
- Collection of the information needed to evaluate the feasibility of remediation alternatives.

Decision I samples will be submitted to analytical laboratories for the analyses listed in Table 3-1. Decision II samples will be submitted for the analysis of all COCs identified during Decision I sampling. In addition, samples will be submitted for analyses as needed to support waste management or health and safety decisions.

For CAS 23-20-02, Injection Well, there is insufficient data available to apply the Decision I statement without first determining the existence of this potential release. Therefore, a third decision statement has been established to address the uncertainty of the existence of this CAS:

Pre-Decision I: “Does the Injection Well identified as CAS 23-20-02 or any remaining features of the well exist?” Investigative methods will be executed in order to determine the existence, location, and current condition of CAS 23-20-02. If physical evidence of the CAS, the feature itself or residual material, is detected, then Decision I will be resolved. Otherwise, the investigation for that CAS is complete.

The DQIs of precision, accuracy, representativeness, completeness, comparability, and sensitivity needed to satisfy DQO requirements are discussed in Section 6.2. Laboratory data will be assessed in the investigation report to confirm or refute the CSM and determine if the DQO data needs were met.

To satisfy the DQI of sensitivity (presented in Section 6.2.8), the analytical methods must be sufficient to detect contamination that is present in the samples at concentrations equal to the corresponding PAL concentrations. Analytical methods and minimum reporting limits (MRLs) or minimum detectable concentrations (MDCs) for each CAU 219 COPC are provided in Table 3-2 and Table 3-3. The MRL is the lowest concentration of a particular chemical parameter that can be detected in a sample within an acceptable level of error. The MDC is the lowest concentration of a particular radionuclide parameter that can be detected in a sample within an acceptable level of error.

Table 3-3
Analytical Requirements for Chemical COPCs for CAU 219
(Page 1 of 2)

Parameter/Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit (MRL)	Laboratory Precision (RPD)[a]	Percent Recovery (%R)[b]
ORGANICS					
Total Volatile Organic Compounds (VOCs)	Aqueous	8260B[c]	Parameter-specific EQLs[d]	Lab-specific[e]	Lab-specific[e]
	Soil				
Total Semivolatile Organic Compounds (SVOCs)	Aqueous	8270C[c]	Parameter-specific EQLs[d]	Lab-specific[e]	Lab-specific[e]
	Soil				
Polychlorinated Biphenyls (PCBs)	Aqueous	8082[c]	Parameter-specific EQLs[f]	Lab-specific[e]	Lab-specific[e]
	Soil				
Total Petroleum Hydrocarbons (TPH) Gasoline-Range Organics	Aqueous	8015B modified[c]	0.5 mg/L[g]	Lab-specific[e]	Lab-specific[e]
	Soil	8015B modified[c]	0.5 mg/kg[g]	Lab-specific[e]	Lab-specific[e]
Total Petroleum Hydrocarbons (TPH) Diesel-Range Organics	Aqueous	8015B modified[c]	5 mg/L[g]	Lab-specific[e]	Lab-specific[e]
	Soil	8015B modified[c]	25 mg/kg[g]	Lab-specific[e]	Lab-specific[e]
Ethylene Glycol	Aqueous	8015B modified[c]	10 mg/L[g]	Lab-specific[e]	Lab-specific[e]
	Soil	8015B modified[c]	30 mg/kg[g]	Lab-specific[e]	Lab-specific[e]
INORGANICS					
Total RCRA Metals, plus Beryllium					
Arsenic	Aqueous	6010B[c]	0.01 mg/L[g, h]	20[h]	Matrix Spike Recovery at 75-125[h] Laboratory Control Sample Recovery at 80 - 120[h]
	Soil	6010B[c]	1 mg/kg[g, h]	35[g]	
Barium	Aqueous	6010B[c]	0.20 mg/L[g, h]	20[h]	
	Soil	6010B[c]	20 mg/kg[g, h]	35[g]	
Beryllium	Aqueous	6010B[c]	0.005 mg/L[g, h]	20[h]	
	Soil	6010B[c]	0.5 mg/kg[g, h]	35[g]	
Cadmium	Aqueous	6010B[c]	0.005 mg/L[g, h]	20[h]	
	Soil	6010B[c]	0.5 mg/L[g, h]	35[g]	
Chromium	Aqueous	6010B[c]	0.01 mg/L[g, h]	20[h]	
	Soil	6010B[c]	1 mg/kg[g, h]	35[g]	
Lead	Aqueous	6010B[c]	0.003 mg/L[g, h]	20[h]	
	Soil	6010B[c]	0.3 mg/kg[g, h]	35[g]	
Lithium	Aqueous	6010B[c]	0.01 mg/L[g, h]	20[h]	
	Soil	6010B[c]	1.0 mg/kg[g, h]	35[g]	
Mercury	Aqueous	7470A[c]	0.0002 mg/L[g, h]	20[h]	
	Soil	7471A[c]	0.1 mg/kg[g, h]	35[g]	
Nickel	Aqueous	6010B[c]	0.02 mg/L[g, h]	20[h]	
	Soil	6010B[c]	2.0 mg/kg[g, h]	35[g]	
Selenium	Aqueous	6010B[c]	0.005 mg/L[g, h]	20[h]	
	Soil	6010B[c]	0.5 mg/kg[g, h]	35[g]	

Table 3-3
Analytical Requirements for Chemical COPCs for CAU 219
(Page 2 of 2)

Parameter/Analyte	Medium or Matrix	Analytical Method	Minimum Reporting Limit (MRL)	Laboratory Precision (RPD)[a]	Percent Recovery (%R)[b]
INORGANICS					
Total RCRA Metals, plus Beryllium					
Silver	Aqueous	6010B[c]	0.01 mg/L[g, h]	20[h]	Matrix Spike Recovery at 75-125[h] Laboratory Control Sample Recovery at 80 - 120[h]
	Soil	6010B[c]	1 mg/kg[g, h]	35[g]	

[a]Relative percent difference (RPD) is used to calculate precision. Precision is estimated from the RPD of the concentrations measured for the matrix spike and matrix spike duplicate or of laboratory, or field duplicates of unspiked samples. It is calculated by: $RPD = 100 \times \{(|A_1 - A_2|)/[(A_1 + A_2)/2]\}$, where A_1 = Concentration of the parameter in the initial sample aliquot, A_2 = Concentration of the parameter in the duplicate sample aliquot.
[b]The %R is used to calculate accuracy. Accuracy is assessed from the recovery of parameters spiked into a blank or sample matrix of interest, or from the recovery of surrogate compounds spiked into each sample. The recovery of each spiked parameter is calculated by: $\%R = 100 \times (A_s - A_u/A_n)$, where A_s = Concentration of the parameter in the spiked sample, A_u = Concentration of the parameter in the unspiked sample, A_n = Concentration increase that should result from spiking the sample.
[c]EPA *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, 3rd Edition, Parts 1-4, (SW-846) CD ROM, Washington, DC (EPA,1996).
[d]Estimated Quantitation Limit as given in SW-846 (EPA, 1996).
[e]In-House Generated RPD and %R Performance Criteria. It is necessary for laboratories to develop in-house performance criteria and compare them to those in the methods. The laboratory begins by analyzing 15 to 20 samples of each matrix and calculating the mean %R for each parameter. The standard deviation (SD) of each %R is then calculated, and the warning and control limits for each parameter are established at ± 2 SD and ± 3 SD from the mean, respectively. If the warning limit is exceeded during the analysis of any sample delivery group (SDG), the laboratory institutes corrective action to bring the analytical system back into control. If the control limit is exceeded, the sample results for that SDG are considered unacceptable. These limits are reviewed after every quarter and are updated when necessary. The laboratory tracks trends in both performance and control limits by the use of control charts. The laboratory's compliance with these requirements is confirmed as part of an annual laboratory audit. Similar procedures are followed in order to generate acceptance criteria for precision measurements.
[f]EPA *Contract Laboratory Program (CLP) Statement of Work for Organic Analysis* (EPA, 1988b; 1991; and 1994b)
[g]*Industrial Sites Quality Assurance Project Plan* (NNSA/NV, 2002a)
[h]EPA *Contract Laboratory Program Statement of Work for Inorganic Analysis* (EPA, 1988a; 1994a; and 1995)

Definitions:
EQLs = Estimated quantitation limits
mg/L = Milligrams per liter
mg/kg = Milligrams per kilogram
NA = Not applicable
RPD = Relative percent difference
%R = Percent recovery

4.0 Field Investigation

This section contains a description of the activities to be conducted to gather and document information from the CAU 219 field investigation.

4.1 Technical Approach

The information necessary to satisfy the DQO data needs will be generated for each CAU 219 CAS by collecting and analyzing samples generated during a field investigation. The presence and nature of contamination at each CAS will be evaluated by collecting samples at biased locations that are determined to be most probable to contain COCs if they are present anywhere within the CAS. The locations will be determined based on their identification using the biasing factors listed in Section A.5.3 of Appendix A. If while defining the nature of contamination it is determined that COCs are present at a CAS, that CAS will be further addressed by determining the extent of contamination before evaluating corrective action alternatives.

Sample locations may be modified based on site conditions, obvious debris or staining of soils, field-screening results, or professional judgement. The Task Manager or Site Supervisor has the discretion to modify the biased locations if the modified locations meet the DQO decision needs and criteria stipulated in Appendix A.

Since this CAIP only addresses contamination originating from the CAU, it may be necessary to distinguish overlapping contamination originating from other sources. For example, widespread surface radiological contamination originating from atmospheric tests will not be addressed in the CAU 219 investigation. To determine if contamination is from the CAU or from other sources, soil samples may be collected from background locations at selected CASs.

Modifications to the investigative strategy may be required should unexpected field conditions be encountered at any CAS. Significant modifications shall be justified and documented on a Record of Technical Change (ROTC) prior to implementation. If an unexpected condition indicates that conditions are significantly different than the corresponding CSM, the activity will be rescoped and the identified decision makers will be notified.

4.2 Field Activities

Field activities at CAU 219 include site preparation, sample location selection, and sample collection activities.

4.2.1 Site Preparation Activities

Site preparation will be conducted by the NTS Management and Operating (M&O) Contractor prior to the investigation. Site preparation may include, but not be limited to: relocation or removal of surface debris, equipment, and structures; the construction of hazardous waste accumulation areas (HWAAs) and site exclusion zones; providing sanitary facilities; the construction of decontamination facilities; and temporarily moving staged equipment.

Prior to mobilization for collecting investigation samples, the following preparatory activities will also be conducted:

- Perform site walk-down and visual surveys at all CASs within CAU 219 to identify any staining, discoloration, disturbance of native soils, or any other indication of potential contamination
- Prepare site for investigation (i.e., construct decontamination pad, HWAAs, exclusion zones)
- Identify predetermined sample locations
- Remove debris at CAS 03-11-01
- Investigate Pre-Decision I at CAS 23-20-02

4.2.2 Sample Location Selection

Biasing factors (including field-screening results) will be used to select the most appropriate samples from a particular location for submittal to the analytical laboratory. Biasing factors to be used for selection of sampling locations are listed in Section A.5.3 of Appendix A.

As biasing factors are identified and used for selection of sampling locations, they will be documented in the appropriate field documents. The CAS-specific sampling strategy and the estimated locations of biased samples for each CAS are discussed in Section A.9.0 of Appendix A.

4.2.3 Sample Collection

The CAU 219 sampling program will consist of the following activities:

- Collect and analyze samples from locations as described in this section.
- Collect required QC samples.
- Collect waste management samples.
- Collect soil samples from background locations, if necessary.
- Stake or flag sample locations and record global positioning system coordinates.

Decision I surface soil samples will be collected from selected locations based on the CSM, biasing factors, field-screening results, and existing data. If biasing factors are present in soils below locations where Decision I samples were collected, subsurface Decision I soil samples will also be collected by hand augering, backhoe excavation, direct-push, or drilling techniques, as appropriate. Decision I subsurface soil samples will be collected at depth intervals selected by the Task Manager or Site Supervisor based on biasing factors to a depth where the biasing factors are no longer present. The content of collection features, tanks, and piping will be sampled to characterize the waste for potential disposal.

Decision II sampling will consist of further defining the extent of contamination where COCs have been confirmed. Step-out (Decision II) sampling locations at each CAS will be selected based on the CSM, biasing factors, field-screening results, existing data, and the outer boundary sample locations where COCs were detected. In general, step-out sample locations will be arranged in a triangular pattern around areas containing a COC at distances based on site conditions, COC concentrations, process knowledge, and biasing factors. If COCs extend beyond step-out locations, additional Decision II samples will be collected from locations further from the source. If a spatial boundary is reached, the CSM is shown to be inadequate, or the Site Supervisor determines that extent sampling needs to be re-evaluated; work will be temporarily suspended, NDEP will be notified, and the investigation strategy will be reevaluated. A minimum of one analytical result less than the action level from each lateral and vertical direction will be required to define the extent of COC contamination. The lateral and vertical extent of COCs will only be established based on validated laboratory analytical results (i.e., not field screening).

The number, location, and spacing of step-outs may be modified by the Task Manager or Site Supervisor, as warranted by site conditions. Where sampling locations are modified by the Task

Manager or Site Supervisor, the justification for these modifications will be documented in the field logbook. Section 3.4 provides the analytical methods and laboratory requirements (i.e., detection limits, precision, and accuracy requirements) to be used when analyzing the COPCs. The analytical program for each CAS is presented in Table 3-1. All sampling activities and quality control requirements for field and laboratory environmental sampling will be conducted in compliance with the Industrial Sites QAPP (NNSA/NV, 2002a) and other applicable, approved procedures.

4.3 Safety

A current version of the Environmental Engineering Services Contractor's programmatic HASP and IS HASP will accompany the field documents. An FWP, or equivalent, will be prepared and approved prior to the field effort. As required by the DOE Integrated Safety Management System (ISMS) (DOE/NV, 1997), these documents outline the requirements for protecting the health and safety of the workers and the public, and the procedures for protecting the environment. The ISMS program requires that site personnel will reduce or eliminate the possibility of injury, illness, or accidents, and to protect the environment during all project activities. The following safety issues will be taken into consideration when evaluating the hazards and associated control procedures for field activities discussed in the IS HASP and FWP:

- Potential hazards to site personnel and the public include, but are not limited to: radionuclides, asbestos, chemicals (e.g. heavy metals, VOCs, semivolatile organic compounds (SVOC)s, petroleum hydrocarbons, and ethylene glycol), adverse and rapidly changing weather, remote location, and motor vehicle and heavy equipment operations.
- Proper training of all site personnel to recognize and mitigate the anticipated hazards.
- Work controls to reduce or eliminate the hazards including engineering controls, substitution of less hazardous materials, and use of appropriate personal protective equipment (PPE).
- Occupational exposure monitoring for controlling worker exposures to hazardous substances such as radionuclides, asbestos, chemicals, and physical agents (e.g., heat, cold, and high wind).
- Radiological surveying for alpha/beta and gamma emitters to minimize and/or control personnel exposures; use of the "as-low-as-reasonably-achievable" principle when addressing radiological hazards.

- Emergency and contingency planning to include medical care and evacuation, decontamination, spill control measures, and appropriate notification of project management. The same principles apply to emergency communications.

- Potential asbestos containing material will be collected by qualified personnel.

5.0 Waste Management

Management of IDW will be based on regulatory requirements, field observations, process knowledge, radiological surveys, and laboratory results from CAU 219 investigation samples.

Disposable sampling equipment, PPE, and rinsate are considered potentially contaminated waste only by virtue of contact with potentially contaminated media (e.g., soil) or potentially contaminated debris (e.g., construction materials). Therefore, sampling and analysis of IDW, separate from analyses of site investigation samples, may not be necessary for all IDW. However, if associated investigation samples are found to contain contaminants above regulatory levels, conservative estimates of total waste contaminant concentrations may be made based on the mass of the waste, the amount of contaminated media contained in the waste, and the maximum concentration of contamination found in the media. Direct samples of IDW may also be taken to support waste characterization.

Sanitary, hazardous, radioactive, and/or mixed waste, if generated, will be managed and disposed of in accordance with DOE Orders, U.S. Department of Transportation (DOT) regulations, state and federal waste regulations, and agreements and permits between DOE and NDEP.

5.1 Waste Minimization

Investigation activities are planned to minimize IDW generation. This will be accomplished by incorporating the use of process knowledge, visual examination, and/or radiological survey and swipe results. When possible, disturbed media (such as soil removed during trenching) or debris will be returned to its original location. Contained media (e.g., soil managed as waste) as well as other IDW will be segregated to the greatest extent possible to minimize generation of hazardous, radioactive, or mixed waste. Hazardous material used at the sites will be controlled in order to limit unnecessary generation of hazardous or mixed waste. Administrative controls, including decontamination procedures and waste characterization strategies, will minimize waste generated during investigations.

5.2 Potential Waste Streams

Waste generated during the investigation activities will include the following potential waste streams:

- PPE and disposable sampling equipment (e.g., plastic, paper, sample containers, aluminum foil, spoons, bowls)
- Decontamination rinsate
- Environmental media (e.g., soil)
- Surface debris in investigation area (e.g., discarded equipment or asbestos tiles)
- Field-screening waste (e.g., soil, spent solvent, rinsate, disposable sampling equipment, and PPE contaminated by field-screening activities)

Office trash and lunch waste will be sent to the sanitary land fill by placing the waste in the dumpster. Each waste stream generated will be reviewed and segregated at the point of generation by the following waste types:

- Sanitary waste
- Hazardous waste pending analysis
- Polychlorinated biphenyl waste pending analysis
- Radioactive waste pending analysis
- Mixed waste pending analysis

5.3 Investigation-Derived Waste Management

The on-site management and ultimate disposition of IDW will be determined based on a determination of the waste type (e.g., sanitary, low-level, hazardous, hydrocarbon, mixed), or the combination of waste types. A determination of the waste type will be guided by several factors, including, but not limited to: the analytical results of samples either directly or indirectly associated with the waste, historical site knowledge, knowledge of the waste generation process, field observations, field-monitoring/screening results, and/or radiological survey/swipe results. Office trash and lunch waste will be sent to the A23 Mercury Landfill by placing the waste in a dumpster. Each waste stream generated will be reviewed and segregated to the greatest extent at the point of generation.

Table 4-2 of the NV/YMP RadCon Manual (DOE/NV, 2000a) shall be used to determine if such materials may be declared nonradioactive. On-site IDW management requirements by waste type are detailed in the following sections. Applicable waste management regulations and requirements are listed in Table 5-1.

5.3.1 Sanitary Waste

Sanitary IDW generated at each CAS will be collected, managed, and disposed of in accordance with the sanitary waste management regulations and the permits for operation of the Area 9, U10C Landfill. The bags of sanitary IDW will be counted and documented in the field activity daily log.

5.3.2 Special Sanitary Waste

Hydrocarbon waste containing more than 100 milligrams per kilogram (mg/kg) of TPH will be managed on site in a drum or other appropriate container until fully characterized. Hydrocarbon waste may be disposed of at a designated hydrocarbon landfill (NDEP, 1997b), an appropriate hydrocarbon waste management facility (e.g., recycling facility), or other method in accordance with State of Nevada regulations.

Asbestos-containing materials encountered or generated during this investigation will be managed and disposed of in accordance with appropriate federal (CFR, 2003c) and State of Nevada (NAC, 2004d) regulations.

5.3.3 Hazardous Waste

Suspected hazardous wastes will be placed in DOT-compliant containers. All containerized hazardous waste will be handled, inspected, and managed in accordance with Title 40 *Code of Federal Regulations* (CFR) 265, Subpart I (CFR, 2003a). These provisions include managing the waste in containers compatible with the waste type, and segregating incompatible waste types so that in the event of a spill, leak, or release, incompatible wastes shall not contact one another. Corrective Action Unit 219 will have waste storage areas established according to the needs of the project. Satellite accumulation areas and HWAAs will be managed consistent with the requirements of federal and state regulations (CFR, 2003a, and NAC, 2004b). They will be properly controlled for access and equipped with spill kits and appropriate spill containment.

Table 5-1
Waste Management Regulations and Requirements

Waste Type	Federal Regulation	Additional Requirements
Solid (nonhazardous)	NA	NRS[a] 444.440 - 444.620 NAC[b] 444.570 - 444.7499 NTS Landfill Permit SW13.097.04[c] NTS Landfill Permit SW13.097.03[d]
Liquid/Rinsate (nonhazardous)	NA	Water Pollution Control General Permit GNEV93001, Rev. 3iii[e]
Hazardous	RCRA[f], 40 CFR 260-282	NRS[a] 459.400 - 459.600 NAC[b] 444.850 - 444.8746 POC[g]
Low-Level Radioactive	NA	DOE Orders and NTSWAC[h]
Mixed	RCRA[f], 40 CFR 260-282	NTSWAC[h] POC[g]
Hydrocarbon	NA	NTS Landfill Permit SW13.097.02[i]
Polychlorinated Biphenyls	TSCA[j], 40 CFR 761	NRS[a] 459.400 - 459.600 NAC[b] 444.940 - 444.9555
Asbestos	TSCA[j], 40 CFR 763	NRS[a] 618.750-618.840 NAC[b] 444.965-444.976

[a]*Nevada Revised Statutes* (NRS, 2003a, b, c)
[b]*Nevada Administrative Code* (NAC, 2004a, b, c, d)
[c]Area 23 Class II Solid Waste Disposal Site (NDEP, 1997a)
[d]Area 9 Class III Solid Waste Disposal Site (NDEP, 1997c)
[e]Nevada Test Site Sewage Lagoons (NDEP, 1999)
[f]*Resource Conservation and Recovery Act* (CFR, 2003a)
[g]*Nevada Test Site Performance Objective for the Certification of Nonradioactive Hazardous Waste* (BN, 1995)
[h]Nevada Test Site Waste Acceptance Criteria, Revision 5 (NNSA/NSO, 2003)
[i]Area 6 Class III Solid Waste Disposal Site for hydrocarbon waste (NDEP, 1997b)
[j]*Toxic Substance Control Act* (CFR, 2003b and c)

CFR = *Code of Federal Regulations*
DOE = U.S. Department of Energy
NA = Not applicable
NAC = *Nevada Administrative Code*
NDEP = Nevada Division of Environmental Protection
NRS = *Nevada Revised Statutes*
NTS = Nevada Test Site
NTSWAC = *Nevada Test Site Waste Acceptance Criteria*
POC = *Nevada Test Site Performance Objective for the Certification of Nonradioactive Hazardous Waste*
RCRA = *Resource Conservation and Recovery Act*
TSCA = *Toxic Substance Control Act*

The HWAAs will be covered under a site-specific emergency response and contingency action plan until such time that the waste is determined to be nonhazardous or all containers of hazardous waste have been removed from the storage area. Hazardous wastes will be characterized in accordance with the requirements of Title 40 CFR 261 (CFR, 2003a). Any waste determined to be hazardous will be transported in accordance with RCRA and DOT requirements to a permitted treatment, storage, and disposal facility (CFR, 2003a).

5.3.4 Management of Personal Protective Equipment

The PPE and disposable sampling equipment will be visually inspected for stains, discoloration, and gross contamination as the waste is generated. Any IDW that meets this description will be segregated and managed as potentially hazardous waste. This segregated population of waste will either be (1) assigned the characterization of the soil/sludge that was sampled, (2) sampled directly, or (3) undergo further evaluation using the soil/sludge sample results to determine how much soil/sludge would need to be present in the waste to exceed regulatory levels. The PPE and equipment that is not visibly stained, discolored, or grossly contaminated and that is within radiological unrestricted criteria will be managed as nonhazardous sanitary waste.

5.3.5 Management of Decontamination Rinsate

Rinsate at CAU 219 will not be considered hazardous waste unless there is evidence that the rinsate may display a RCRA characteristic. Evidence may include such things as the presence of a visible sheen, pH, or association with equipment/materials used to respond to a release/spill of a hazardous waste/substance. Decontamination rinsate that is potentially hazardous (using associated sample results and/or process knowledge) will be managed as “characteristic” hazardous waste (CFR, 2003a). The regulatory status of the potentially hazardous rinsate will be determined through the application of associated sample results or through direct sampling. If the associated samples do not indicate the presence of hazardous constituents, then the rinsate will be considered to be nonhazardous.

The disposal of nonhazardous rinsate will be consistent with guidance established in current NNSA/NSO Fluid Management Plans for the NTS as follows:

- Rinsate that is determined to be nonhazardous and contaminated to less than 5x *Safe Drinking Water Standards* (SDWS) is not restricted as to disposal. Nonhazardous rinsate that is contaminated at 5x to 10x SDWS will be disposed of in an established infiltration basin or solidified and disposed of as sanitary waste or low-level waste in accordance with the respective sections of this document.

- Nonhazardous rinsate that is contaminated at greater than 10x SDWS will be disposed of in a lined basin or solidified and disposed of as sanitary waste or low-level waste in accordance with the respective sections of this document.

5.3.6 Management of Soil

This waste stream consists of soil removed for disposal during soil sampling, excavation, and/or drilling. This waste stream will be characterized based on laboratory analytical results from representative locations. If the soil is determined to potentially contain COCs, the material will either be managed on site by berming and covering next to the excavation, or by placement in a container(s). The disposal of soil containing COCs may be deferred until implementation of corrective action at the site. Soil placed back into the borehole/excavation in the same approximate location from which it originated is not considered to be waste.

5.3.7 Management of Debris

This waste stream can vary depending on site conditions. Debris that requires removal for the investigation activities (e.g., soil sampling, excavation, and/or drilling) must be characterized for proper management and disposition. Historical site knowledge, knowledge of the waste generation process, field observations, field-monitoring/screening results, radiological survey/swipe results and/or the analytical results of samples either directly or indirectly associated with the waste may be used to characterize the debris. Debris will be visually inspected for stains, discoloration, and gross contamination. Debris may be deemed reusable, recyclable, sanitary waste, hazardous waste, PCB waste, or low-level waste. Waste that is not sanitary will be entered into an approved waste management system, where it will be managed and dispositioned according to federal and state requirements, and agreements between NNSA/NSO and the State of Nevada. The debris will either be managed on site by berming and covering next to the excavation, or by placement in a container(s). The disposal of debris may be deferred until implementation of corrective action at the site.

5.3.8 Field-Screening Waste

The use of field test kits and/or instruments may result in the generation of small quantities of hazardous wastes. If hazardous waste is produced by field screening, it will be segregated from other IDW and managed in accordance with the hazardous waste regulations (CFR, 2003a). On radiological sites, this may increase the potential to generate mixed waste; however, the generation of a mixed waste will be minimized as much as practicable. In the event a mixed waste is generated, the waste will be managed in accordance with Section 5.3.11 of this document.

5.3.9 Polychlorinated Biphenyls

The management of PCBs is governed by the *Toxic Substances Control Act* (TSCA) (USC, 1976) and its implementing regulations at 40 CFR 761 (CFR, 2003b). Polychlorinated biphenyls contamination may be found as a sole contaminant or in combination with any of the types of waste discussed in this document. For example, PCBs may be a co-contaminant in soil that contains a RCRA waste (PCB/hazardous waste), or in soil that contains radioactive wastes (PCB/radioactive waste), or even in mixed waste (PCB/radioactive/hazardous waste). The IDW will initially be evaluated using analytical results for media samples from the investigation. If any type of PCB waste is generated, it will be managed according to 40 CFR 761 (CFR, 2003b) as well as State of Nevada requirements, (NAC, 2004c) guidance, and agreements with NNSA/NSO.

5.3.10 Low-Level Waste

Radiological swipe surveys and/or direct-scan surveys may be conducted on reusable sampling equipment, PPE, and disposable sampling equipment waste streams exiting a radiologically controlled area. This allows for the immediate segregation of radioactive waste from waste that may be unrestricted regarding radiological release. Contamination limits, as defined in Table 4-2 of the current version of the NV/YMP RadCon Manual (DOE/NV, 2000a), will be used to determine if such waste may be declared unrestricted regarding radiological release versus being declared radioactive waste. Direct sampling of the waste may be conducted to aid in determining if a particular waste unit (e.g., drum of soil) contains low-level radioactive waste, as necessary. Waste that is determined to be below the values of Table 4-2, by either direct radiological survey/swipe results or through process knowledge, will not be managed as potential radioactive waste but will be managed in accordance with the appropriate section of this document. Wastes in excess of Table 4-2 values will be managed as potential radioactive waste and be managed in accordance with this section and any other applicable sections of this document.

Low-level radioactive waste, if generated, will be managed in accordance with the contractor-specific waste certification program plan, DOE Orders, and the requirements of the current version of the *Nevada Test Site Waste Acceptance Criteria* (NTSWAC) (NNSA/NSO, 2003). Potential radioactive waste drums containing soil, PPE, disposable sampling equipment, and/or rinsate may be staged at a designated radioactive materials area (RMA) or radiologically controlled area when full or at the end of an investigation phase. The waste drums will remain at the RMA pending certification and disposal under NTSWAC requirements (NNSA/NSO, 2003).

5.3.11 Mixed Waste

Mixed waste, if generated, shall be managed and dispositioned according to the requirements of RCRA (CFR, 2003a) or subject to agreements between NNSA/NSO and the State of Nevada, as well as DOE requirements for radioactive waste. The waste will be marked with "Hazardous Waste Pending Analysis and Radioactive Waste Pending Analysis." Waste characterized as mixed will not be stored for a period of time that exceeds the requirements of RCRA unless subject to agreements between NNSA/NSO and the State of Nevada. The mixed waste shall be transported via an approved hazardous waste/radioactive waste transporter to the NTS transuranic waste storage pad for storage pending treatment or disposal. Waste with hazardous waste constituent concentrations below Land Disposal Restrictions may be disposed of at the NTS Area 5 Radioactive Waste Management Site if the waste meets the requirements of the NTSWAC (NNSA/NSO, 2003). Waste with hazardous waste constituent concentrations exceeding Land Disposal Restrictions will require development of a treatment and disposal plan under the requirements of the Mutual Consent Agreement between DOE and the State of Nevada (NDEP, 1995).

6.0 Quality Assurance/Quality Control

The overall objective of the characterization activities described in this CAIP is to collect accurate and defensible data to support the selection and implementation of a closure alternative for each CAS in CAU 219. Section 6.1 and Section 6.2 discuss the collection of required QC samples in the field and QA requirements for laboratory/analytical data to achieve closure. Unless otherwise stated in this CAIP or required by the results of the DQO process (see Appendix A), this investigation will adhere to the Industrial Sites QAPP (NNSA/NV, 2002a).

6.1 Quality Control Field Sampling Activities

Field QC samples will be collected in accordance with established procedures. Field QC samples are collected and analyzed to aid in determining the validity of environmental sample results. The number of required QC samples depends on the types and number of environmental samples collected. The types of QC samples to be collected for this investigation include:

- Trip blanks (one per sample cooler containing VOC environmental samples)
- Equipment rinsate blanks (one per sampling event for each type of decontamination procedure)
- Source blanks (one per lot of source material that contacts sampled media)
- Field duplicates (1 per 20 environmental samples or 1 per CAS per matrix, if less than 20 collected)
- Field blanks (1 per 20 environmental samples or 1 per field condition, if less than 20 collected)
- Laboratory QC samples (1 per 20 environmental samples or 1 per CAS per matrix, if less than 20 collected - not required for all radionuclide measurements)

Additional QC samples may be submitted based on site conditions at the discretion of the Task Manager or Site Supervisor. Field QC samples shall be analyzed using the same analytical procedures implemented for associated environmental samples. Additional details regarding field QC samples are available in the Industrial Sites QAPP (NNSA/NV, 2002a).

6.2 Laboratory/Analytical Quality Assurance

Criteria for the investigation, as stated in the DQOs (Appendix A) and except where noted, require laboratory analytical quality data be used for making critical decisions. Rigorous QA/QC will be implemented for all laboratory samples including documentation, data verification and validation of analytical results, and an assessment of DQIs as they relate to laboratory analysis.

6.2.1 Data Validation

Data verification and validation will be performed in accordance with the Industrial Sites QAPP (NNSA/NV, 2002a), except where otherwise stipulated in this CAIP. All chemical laboratory data from samples collected and analyzed will be evaluated for data quality according to EPA Functional Guidelines (EPA, 1999 and 2002). Radiological laboratory data from samples that are collected and analyzed will be evaluated for data quality according to company-specific procedures. The data will be reviewed to ensure that all suspected samples were appropriately collected, analyzed, and the results passed data validation criteria. Validated data, including estimated data (i.e., J-qualified), will be assessed to determine if they meet the DQO requirements of the investigation and the performance criteria for the DQIs. The results of this assessment will be documented in the corrective action decision document (CADD). If the DQOs were not met, corrective actions will be evaluated, selected, and implemented (e.g., refine CSM or resample to fill data gaps).

6.2.2 Data Quality Indicators

The DQIs are qualitative and quantitative descriptors used in interpreting the degree of acceptability or utility of data. Data quality indicators are used to evaluate the entire measurement system and laboratory measurement processes (i.e., analytical method performance) as well as to evaluate individual analytical results (i.e., parameter performance). The quality and usability of data used to make DQO decisions will be assessed based on the following DQIs:

- Precision
- Accuracy/bias
- Representativeness
- Comparability

- Completeness
- Sensitivity

Table 6-1 provides the established analytical method/measurement system performance criteria for each of the DQIs and the potential impacts to the decision if the criteria are not met. The following subsections discuss each of the DQIs that will be used to assess the quality of laboratory data.

6.2.3 Precision

Precision is used to assess the variability between two equal samples. This is a measure of the repeatability of the analysis process from sample collection through analysis results. Precision is measured as the relative percent difference (RPD) of duplicate samples as presented in the Industrial Sites QAPP (NNSA/NV, 2002a).

Determinations of precision will be made for field duplicate samples and laboratory duplicate samples. Field duplicate samples will be collected simultaneously with samples from the same source under similar conditions in separate containers. The duplicate sample will be treated independently of the original sample in order to assess field impacts and laboratory performance on precision through a comparison of results. Laboratory precision is evaluated as part of the required laboratory internal QC program to assess performance of analytical procedures. The laboratory sample duplicates are an aliquot, or subset, of a field sample generated in the laboratory. They are not a separate sample but a split, or portion, of an existing sample. Typically, laboratory duplicate QC samples include matrix spike duplicate (MSD) and laboratory control sample (LCS) duplicate samples for organic, inorganic, and radiological analyses.

Precision is a quantitative measure used to assess overall analytical method and field sampling performance as well as to assess the need to “flag” (qualify) individual parameter results when corresponding QC sample results are not within established control limits. Therefore, performance metrics have been established for both analytical methods and individual analytical results (see Table 6-1).

The RPD criteria to be used for assessment of precision for laboratory duplicates are the parameter-specific criteria listed in Table 3-3. The RPD criteria to be used for assessment of precision for field duplicates is analysis and parameter specific. The RPD values that are outside the

Table 6-1
Laboratory and Analytical Performance Criteria for CAU 219 Data Quality Indicators

Data Quality Indicator	Performance Criteria	Potential Impact on Decision if Performance Criteria Not Met
Precision	Variations between laboratory duplicates should not exceed analytical method-specific and laboratory-specific criteria presented in Table 3-2 and Table 3-3. Variations between field duplicates should not exceed 20 percent.	Data that do not meet the performance criteria will not be used for decisions. Decisions may not be valid if analytical method performance criteria for precision are not met. Evaluate the effect on meeting the DQI of completeness.
Accuracy	Laboratory control sample, matrix spike, and surrogate results should be within the method-specific and laboratory-specific criteria presented in Table 3-2 and Table 3-3. Laboratory method blanks should be below the required detection limit.	Data that do not meet the performance criteria will not be used for decisions. Decisions may not be valid if analytical method performance criteria for accuracy are not met. Evaluate the effect on meeting the DQI of completeness.
Sensitivity	Laboratory detection limits must be less than or equal to respective action levels.	Cannot determine if COCs are present or migrating at levels of concern; therefore, the affected data will be assessed for usability and potential impacts on meeting the DQI of completeness.
Comparability	Sampling, handling, preparation, analysis, reporting, and data validation must be performed using approved standard methods and procedures.	Inability to combine data with data obtained from other sources and/or inability to compare data to regulatory action levels.
Representativeness	Decision I samples identify COCs if present anywhere within the CAS. Analyses will be sufficient to detect any COCs present in the samples. Decision II samples identify true extent of COCs.	Analytical results will not represent true site conditions. Inability to make appropriate DQO decisions.
Nature Completeness	80% of the CAS-specific COPC analytes have valid results. 100% of targeted analytes are valid.	Cannot support/defend decision on whether COCs are present.
Extent Completeness	100% of targeted analytes used to define extent of COCs are valid.	Extent of contamination cannot be accurately determined.
Clean Closure Completeness	100% of targeted analytes are valid.	Cannot determine if COCs remain in soil.

criteria do not necessarily result in the qualification of analytical data. It is only one factor in making an overall judgement about the quality of the reported analytical results.

6.2.4 Accuracy

Accuracy is determined by analyzing a reference material of known parameter concentration or by reanalyzing a sample to which a material of known concentration or amount of parameter has been added (spiked). For organic analyses, laboratory control limits are used for evaluation of percent recovery. The acceptable control limits for organic analyses are established in the EPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1999). Accuracy for chemical analyses will be evaluated based on results from two types of spiked samples: matrix spike (MS) and LCS. Accuracy for radiochemical analyses will be evaluated based on results from LCS and MS samples. The LCS sample is analyzed with the field samples using the same sample preparation, reagents, and analytical methods employed for the samples. One LCS will be prepared with each batch of samples for analysis by a specific measurement.

Accuracy is a measure of the closeness of an individual measurement or the average of a number of measurements to the true value. It is used to assess the performance of laboratory measurement processes as well as to evaluate individual groups of analyses (i.e., sample delivery groups).

The criteria for chemical analyses to be used for assessment of accuracy are the parameter-specific criteria listed in Table 3-3. The percent recovery criteria for radiochemical analyses to be used for assessment of accuracy will be the control limits listed in Table 3-2.

The percent recovery parameter performance criteria for accuracy will be compared to percent recovery results of spiked samples. This will be accomplished as part of the data validation process. The percent recovery values that are outside the criteria do not necessarily result in the qualification of analytical data. It is only one factor in making an overall judgment about the quality of the reported analytical results. Factors beyond the laboratory’s control, such as sample matrix effects, can cause the measured values to be outside of the established criteria. Therefore, the entire sampling and analytical process must be evaluated when determining the quality of the analytical data provided.

6.2.5 Representativeness

Representativeness is the degree to which sample characteristics accurately and precisely represent a characteristics of a population or an environmental condition (EPA, 1987). Representativeness is assured by carefully developing the sampling strategy during the DQO process such that false negative and false positive decision errors are minimized. The criteria listed in DQO Step 6 - Specify the Tolerable Limits on Decision Errors are:

- For Decision I, having a high degree of confidence that the sample locations selected will identify COCs if present anywhere within the CAS.
- Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs present in the samples.
- For Decision II, having a high degree of confidence that the sample locations selected will identify the extent of COCs.

These are qualitative measures that will be used to assess measurement system performance for representativeness. The assessment of this qualitative criterion will be presented in the CAU 219 CADD.

6.2.6 Completeness

Completeness is defined as generating sufficient data of the appropriate quality to satisfy the data needs identified in the DQOs. For judgemental sampling, completeness will be evaluated using both a quantitative measure and a qualitative assessment. The quantitative measurement to be used to evaluate completeness is presented in Table 6-1 and is based on the percentage of measurements made that are judged to be valid. The completeness goal for targeted analytes and the remaining COPCs is 100 percent and 80 percent, respectively. If these criteria are not achieved, the dataset will be assessed for potential impacts on making DQO decisions.

The qualitative assessment of completeness is an evaluation of the sufficiency of information available to make DQO decisions. This assessment will be based on meeting the data requirements identified in the DQOs and will be presented in the CAU 219 CADD.

6.2.7 Comparability

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another (EPA, 1987). The criteria for the evaluation of comparability will be that all sampling, handling, preparation, analysis, reporting, and data validation were performed using approved standard methods and procedures. This will ensure that data from this project can be compared to regulatory action levels that were developed based on data generated using the same or comparable methods and procedures. An evaluation of comparability will be presented in the investigation report.

6.2.8 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest (EPA, 2001a). The evaluation criteria for this parameter will be that measurement sensitivity (detection limits) will be less than or equal to the corresponding PALs. If this criterion is not achieved, the affected data will be assessed for usability and potential impacts on meeting site characterization objectives. This assessment will be presented in the investigation report.

7.0 Duration and Records Availability

7.1 Duration

The following is a tentative duration of activities (in calendar days) for corrective action investigation activities:

Duration (days)	Activity
10	Site Preparation
50	Field Work Preparation and Mobilization
5	Pre-Investigation
25	Sampling
105	Data Assessment
180	Waste Management

7.2 Records Availability

Historic information and documents referenced in this plan are retained in the NNSA/NSO project files in Las Vegas, Nevada, and can be obtained through written request to the NNSA/NSO Project Manager. This document is available in the DOE public reading facilities located in Las Vegas and Carson City, Nevada, or by contacting the appropriate DOE Project Manager. The NDEP maintains the official Administrative Record for all activities conducted under the auspices of the FFACO.

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Appendix A

Data Quality Objectives

A.1.0 Introduction

The DQO process described in this appendix is a seven-step strategic systematic planning method based on the scientific method that was used to plan data collection activities for defining performance criteria for the CAU 219, Septic Systems and Injection Wells, field investigation. The DQOs are designed to ensure that the data collected will provide sufficient and reliable information to identify, evaluate, and technically defend recommended corrective actions (i.e., no further action [NFA], closure in place, or clean closure). Existing information about the nature and extent of contamination at the CASs in CAU 219 is insufficient to evaluate and select preferred corrective actions; therefore, a CAI will be conducted.

The CAU 219 CAI will be based on the DQOs presented in this appendix as developed by representatives of the NDEP and the NNSA/NSO. The seven steps of the DQO process presented in Section A.3.0 through Section A.9.0 were developed in accordance with *EPA Guidance for the Data Quality Objectives Process* (2001a) and *EPA Guidance for Quality Assurance Project Plans* (1998). The DQO process presented herein is based on the CAS-specific information presented in Section A.2.0 and the EPA Quality System Document for DQOs entitled, *Data Quality Objectives Process for Hazardous Waste Site Investigations* (2000).

The DQO process presents a judgmental sampling approach. In general, the procedures used in the DQO process provide:

- A scientific basis for making inferences about a site (or portion of a site) based on environmental data or process knowledge.
- A basis for defining decision performance criteria and assessing the achieved decision quality of the data collection design.
- Criteria for knowing when site investigators should stop data collection (i.e., when sufficient information is available to support decisions).
- A basis for demonstrating an acceptable level of confidence in the sampling approach to generate the appropriate quantity and quality of information necessary to minimize the potential for making decision errors.

A.2.0 Background Information

The six CASs in CAU 219 are located in Areas 3, 16, and 23 of the NTS. The CASs include:

- 03-11-01, Steam Pipes and Asbestos Tiles
- 16-04-01, Septic Tanks (3)
- 16-04-02, Distribution Box
- 16-04-03, Sewer Pipes
- 23-20-01, DNA Motor Pool Sewage and Waste System
- 23-20-02, Injection Well

The following sections (Section A.2.1 through Section A.2.4) provide a CAS description, physical setting and operational history, release information, and previous investigation results for each CAS in CAU 219.

A.2.1 CAS 03-11-01, Steam Pipes and Asbestos Tiles

Corrective Action Site 03-11-01 consists of surface debris within the former Area 3 Subdock. This debris includes four pieces of steam pipe and 9- x 9-in. floor tiles attached to the northern end of the concrete pad and scattered on the surface soil. The four pieces of steam pipe are wrapped with fiberglass insulation and a plaster-like substance. Subsurface piping was identified just west of the slab during geophysical surveys; however, engineering drawings indicate that the piping is composed of water pipes. Therefore, the piping will not be investigated as part of the CAI for this CAS (REECo, Date Unknown). Figure A.2-1 shows a site sketch of the CAS.

Physical Setting and Operational History - The Area 3 Subdock Complex is located on the northeast corner of the intersection of 3-03 Road and Mercury Highway. The complex was in operation from the 1970s to 1985 when it was relocated to Area 1. The Steam Plant was used for the steam cleaning of drilling pipe, bits, and other drilling related equipment. Bent drilling pipe was straightened at the Pipe Straightening Shed, which is located northwest of the Steam Plant (Patton, 2003). Although all of the buildings at the Subdock have been removed, many of the concrete foundations remain.

The four pieces of steam pipe are approximately 4 in. in diameter and range in length. Three of the four are located near the concrete pad with one attached to a 15-ft hose. The fourth piece is located

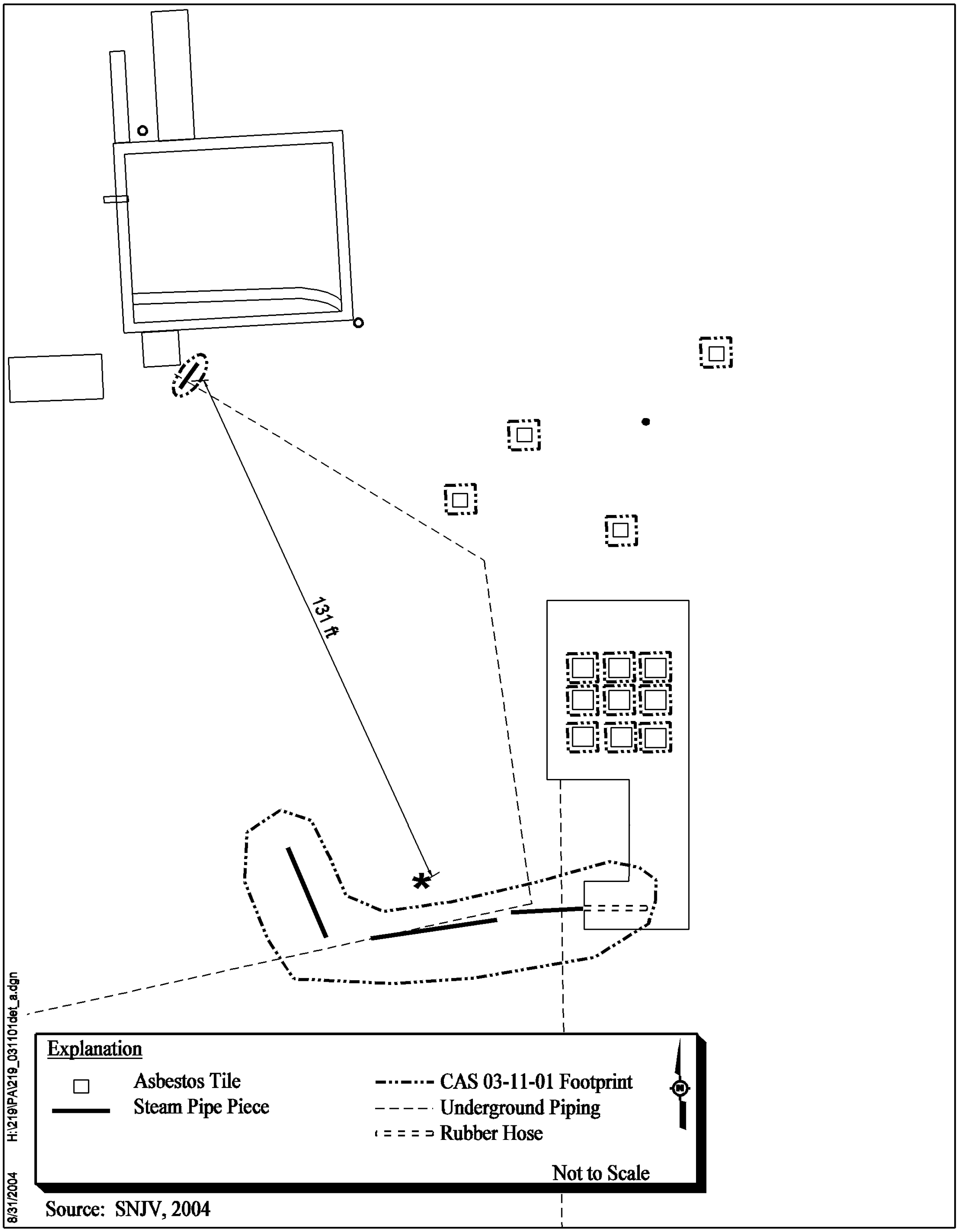

Figure A.2-1
CAS 03-11-01, Steam Pipes and Asbestos Tiles

near the Pipe Straightening Shed to the northwest. These steam pipe remnants are most likely associated with a water tank that once serviced the Steam Plant and Pipe Straightening Shed.

Release Information - There are no known sources of contaminant releases identified at this site.

Previous Investigation Results - The tiles, piping insulation, and surrounding soil have been previously sampled and analyzed for asbestos. Asbestos was not found to be present in either the piping insulation or the surrounding soils; however, the analytical results did confirm 10 to 20 percent chrysotile asbestos in the floor tiles (DataChem, 2004a). Geophysical surveys conducted in 2002 confirm that subsurface piping exists west of the pad (Fahringer, 2004a). However, the piping has been identified to be water pipes that previously directed water from a water tank to nearby facilities; therefore, the pipes will not be investigated. Radiological surveys identified no areas of elevated radiological activity (Alderson, 2004).

A.2.2 CASs 16-04-01, Septic Tanks (3); 16-04-02, Distribution Box; and 16-04-03, Sewer Pipes

Corrective Action Sites 16-04-01, 16-04-02, and 16-04-03 are the components of the former Area 16 Camp septic system. This system contains associated underground sewer piping (16-04-03), a distribution box (16-04-02), three septic tanks (16-04-01), a drainage channel, and a sump excavation. The sewer piping associated with the system is made of vitrified clay and ranges from 4- to 6-in. in diameter. The three septic tanks are each 8 ft in diameter and 25-ft 8-in. long. The drainage channel is approximately 60-ft long, 3- to 4-ft wide, and 2-ft deep and contains concrete remnants to the east of the outfall. The sump is a shallow excavation for tank overflow, approximately 100 x 30 ft, and is surrounded by a 2- to 3-ft high berm. Figure A.2-2 and Figure A.2-3 show the components of each CAS.

Physical Setting and Operational History - CASs 16-04-01, 16-04-02, and 16-04-03 serviced the former Area 16 Camp. The camp was set up in the early 1960s to house the Area 16 tunnel workers (Metcalf, 2004). These facilities were residential in nature and included 52 residential trailers, two dining trailers, a kitchen trailer, a recreation trailer, and two shower trailers. The camp was dismantled sometime between the mid 1960s and 1972 and there are currently no buildings remaining in the Area 16 Camp (Neagle, 2004). It is important to note that no industrial activities are reported

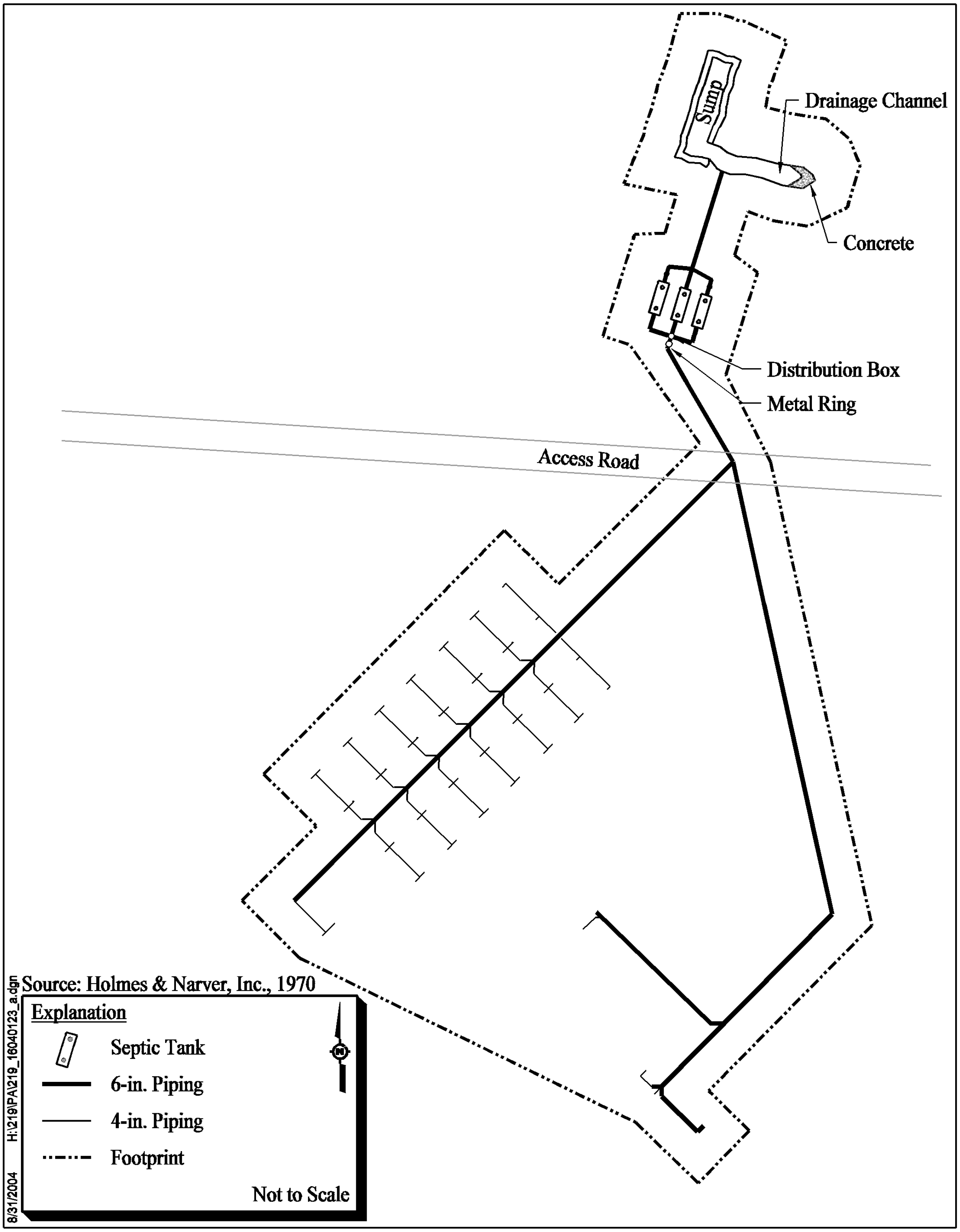

Figure A.2-2
CASs 16-04-01, Septic Tanks (3); 16-04-02, Distribution Box; and 16-04-03 Sewer Pipes

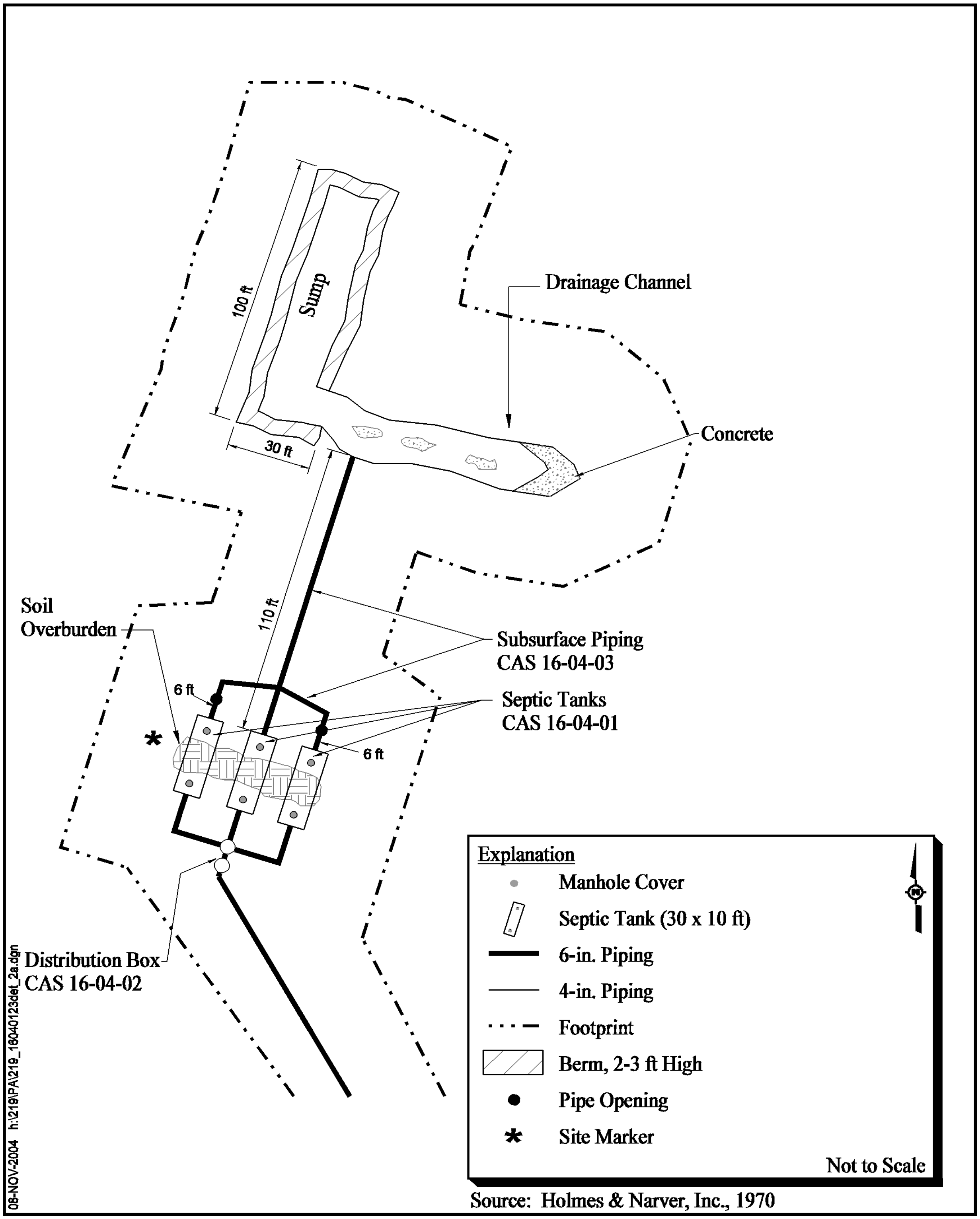

Figure A.2-3
CASs 16-04-01, 16-04-02, and 16-04-03 Components

within the Area 16 Camp and there are no indications that the septic system was used for anything other than sanitary waste.

The sewer piping originates from the Area 16 Camp trailer park located to the south and up gradient of the access road. The pipes converge north of the access road at a concrete man hole and continue north to a distribution box where they are split back into three pipes, each flowing approximately 25 ft north into one of three separate septic tanks (Holmes & Narver, 1970). Each tank is partly visible at the ground surface and has an effluent pipe heading north. These pipes converge and empty into a drainage channel approximately 120 ft north and down gradient of the tanks. The drainage channel opens into the sump excavation to the west.

Release Information - The primary source of potential contamination originates from the effluent that was once discharged through the septic system of the former Area 16 Camp trailers and buildings. Contaminants may have leaked into the surrounding soil directly below or adjacent to the septic system components or may still be residually present in these features. This effluent may have seeped into soils from potential leaks at junctions in the system, potential breaks in the system, and/or potential overflow of the tanks. Due to the nature of the unconsolidated soils and fill along this system, the potential for both vertical and lateral migration of contaminants exists. Although the septic system is reported to have been used strictly for sanitary purposes, the corrective action analytical program will account for the potential that industrial wastes may have been introduced to the system.

Although there is process knowledge available regarding the activities at this CAS, there are no known documented releases associated with CASs 16-04-01, 16-04-02, and 16-04-03 that would initiate identification of target analytes. A comprehensive suite of analytes for these CASs has been developed to encompass the potential operations.

Previous Investigation Results - There are no known analytical results for these CASs. A radiological survey was conducted over the site and no areas with elevated radiological activity were identified. The presence of the tanks and associated underground piping was confirmed during recent visual inspections and geophysical surveys conducted at these sites (Fahringer, 2004b), and radiological surveys identified no areas of elevated radiological activity (Alderson, 2004).

A.2.3 CAS 23-20-01, DNA Motor Pool Sewage and Waste System

Corrective Action Site 23-20-01 consists of the interconnected sanitary sewage and waste systems associated with the former Building 210. Components of this CAS include two grease pits, a catch basin, a floor drain, a sand trap, an oil interceptor, a decontamination pad, a metal battery storage shed, underground piping, a sump, and debris (floor tiles). The grease pits are two elongated structures measuring 27 x 3 ft and the catch basin is 64 x 34 x 46 in. There are both 9- x 9-in. and 12- x 12-in. floor tiles at the site. The decontamination pad to the north is approximately 39 x 23 ft and the sand trap and oil intercepter are both 5.5 ft in diameter and 5.5 ft deep. Figure A.2-4 shows site components of the CAS as described above.

Physical Setting and Operational History - CAS 23-20-01 is located in Mercury at the former Building 210, the DNA Motor Pool. Building 210 was built in 1952 with additions occurring in 1958 and 1967 and was used for vehicle maintenance activities until 1991 when it became a storage facility for nonhazardous waste (Olsen, 2004). The building housed sanitary facilities including a drinking fountain, two lavatories, a urinal, and a toilet. The building was demolished in 2001 (Olsen, 2004), and only the concrete slab, subsurface waste collection features, decontamination pad, and metal battery storage shed remain. All the remaining facilities are inactive and abandoned.

The grease pits are located in the foundation of Building 210 and have been filled with gravel. Engineering drawings show a drain at the bottom of each of the pits that connects to the main waste system (REECo, 1958). The catch basin and floor drain are also located in the foundation of Building 210, east of the two grease pits, and are shown to be connected to the main waste system (REECo, 1958). Some of the floor tiles remain attached to Building 210’s slab and others are scattered around the perimeter.

The concrete decontamination pad was used for decontamination and steam cleaning and is located at the northern edge of the site, immediately adjacent to the Building 210 slab. The pad has a concrete berm around its perimeter, presumably for water containment. The sand trap is located beneath the decontamination pad and is identified by a concrete filled hole. Engineering drawings indicate the sand trap is connected to the waste system (REECo, 1958). According to engineering diagrams, a sump is located beneath the decontamination pad but is not currently visible. The oil interceptor is identified by a concrete filled hole 5 ft to the west of the decontamination pad and is also connected to

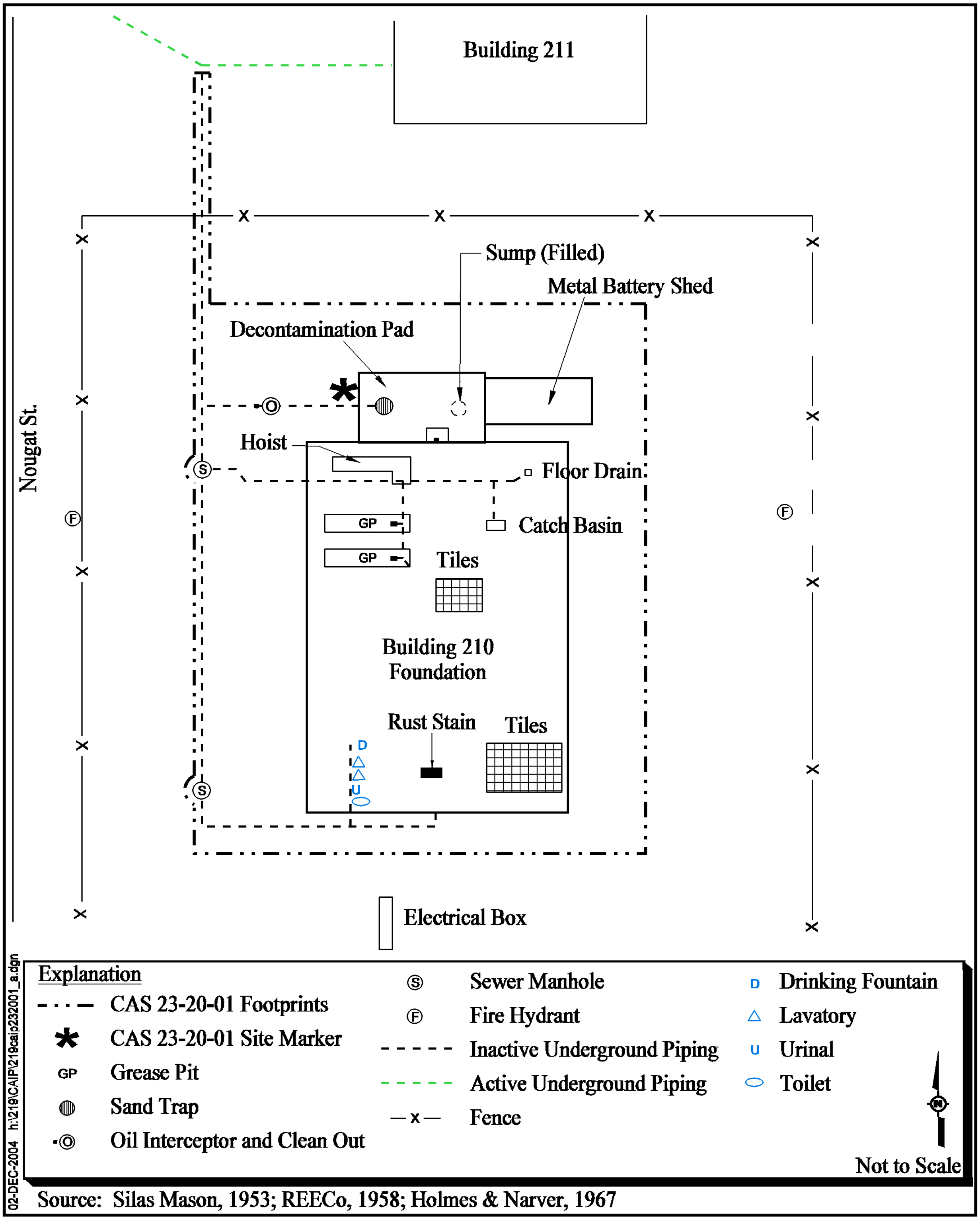

Figure A.2-4
CAS 23-20-01, DNA Motor Pool Sewage and Waste System

the waste system (REECo, 1958). A smaller cover next to the concrete hole marks the location of a cleanout associated with the interceptor. The metal battery storage shed is still standing and located east of the decontamination pad. The shed is labeled for acid and battery storage and is reported to have a lead-lined floor (Olsen, 2004).

Underground piping is also associated with this facility. Two sewer manholes are found on the west side of the building foundation, marking the inactive sewage line. Engineering drawings show that two pipes extend from the south end of the foundation and tie into this west side piping (REECo, 1958). One is at the south central part of the foundation where the heater room was located and the second extends from the southwest part of the building where the lavatories were previously located. At the north end of the building, the floor drain, catch basin, and two grease pits are connected to a pipe beneath the foundation which extends to the sewage pipe west of the building (REECo, 1958). The sand trap and oil interceptor are also connected to this sewage line by another underground pipe. The sewage pipe west of the building runs north to the active piping associated with Building 211; however, the current status of their junction is unknown. The active piping associated with Building 211 is not included in the CAS. The effluent from these lines eventually discharged into the Mercury Sewage Lagoons.

Release Information - The primary source of potential contamination at CAS 23-20-01 is the effluent from the sewage and waste systems of the building that may have leaked from the systems into the ground at junctions and/or breaks or may still be residually present in the features. Contaminants typically associated with a motor pool facility at NTS may include petroleum hydrocarbons, solvents, coolants, and/or metals. Releases at the DNA Motor Pool may have been the result of vehicle maintenance, spills, and/or cleaning (e.g., parts, vehicles) activities. Spillage of materials once stored in the metal battery storage shed are also a potential source of contamination. Since no known historical documentation reports the specific activities associated with the decontamination pad, analyses will account for any potential releases associated with decontamination practices.

Previous Investigation Results - Interviews indicate that sludge samples from the catch basin were collected and analyzed in 1993. Although no data is available, the interviewee recalls that the results indicated the presence of hazardous materials in the sludge (Boehlecke, 2004). Asbestos was not found to be present in the surrounding soils; however, the analytical results did confirm 10 to

20 percent chrysotile asbestos in the floor tiles (DataChem, 2004b). The results of a geophysical survey confirm the presence of the various components and underground piping (Fahringer, 2004b), and radiological surveys identified no areas of elevated radiological activity (Alderson, 2004).

A.2.4 CAS 23-20-02, Injection Well

Corrective Action Site 23-20-02 consists of an injection well located in or near the western corner of former Building 132. The injection well was not identified during the preliminary assessment field investigation. Since former Building 132 and its foundation have been demolished and converted into a parking lot, it is uncertain if the injection well still physically exists or if it was removed during demolition. Figure A.2-5 shows a site sketch of the area most likely to contain the CAS and Section A.9.4 discusses the methodology to be used to identify this feature.

Physical Setting and Operational History - Former Building 132 was the REECo Motor Pool facility. The facility was built in 1952 and used for vehicle maintenance activities (Olsen, 2004). In 1965, the motor pool moved to its current location and former Building 132 was demolished (Gonzalez, 2004). The former Building 132 foundation is no longer present, and the site is currently an active parking lot and storage yard south of the Building 160 warehouse.

Release Information - Historical documentation reports that this feature was a disposal unit that potentially received wastes from the former Building 132 motor pool; however, no known documented releases were identified for this CAS. Due to the uncertainties associated with this site, analyses will account for any potential releases associated with vehicle motor pool activities.

Previous Investigation Results - No analytical results exist for the injection well or the former Building 132. Geophysical surveys were conducted but the CAS feature was not identified (Fahringer, 2004b). Radiological surveys identified no areas of elevated radiological activity (Alderson, 2004). Further geophysical surveys will be performed outside of the original perimeter to determine the presence or absence of the injection well.

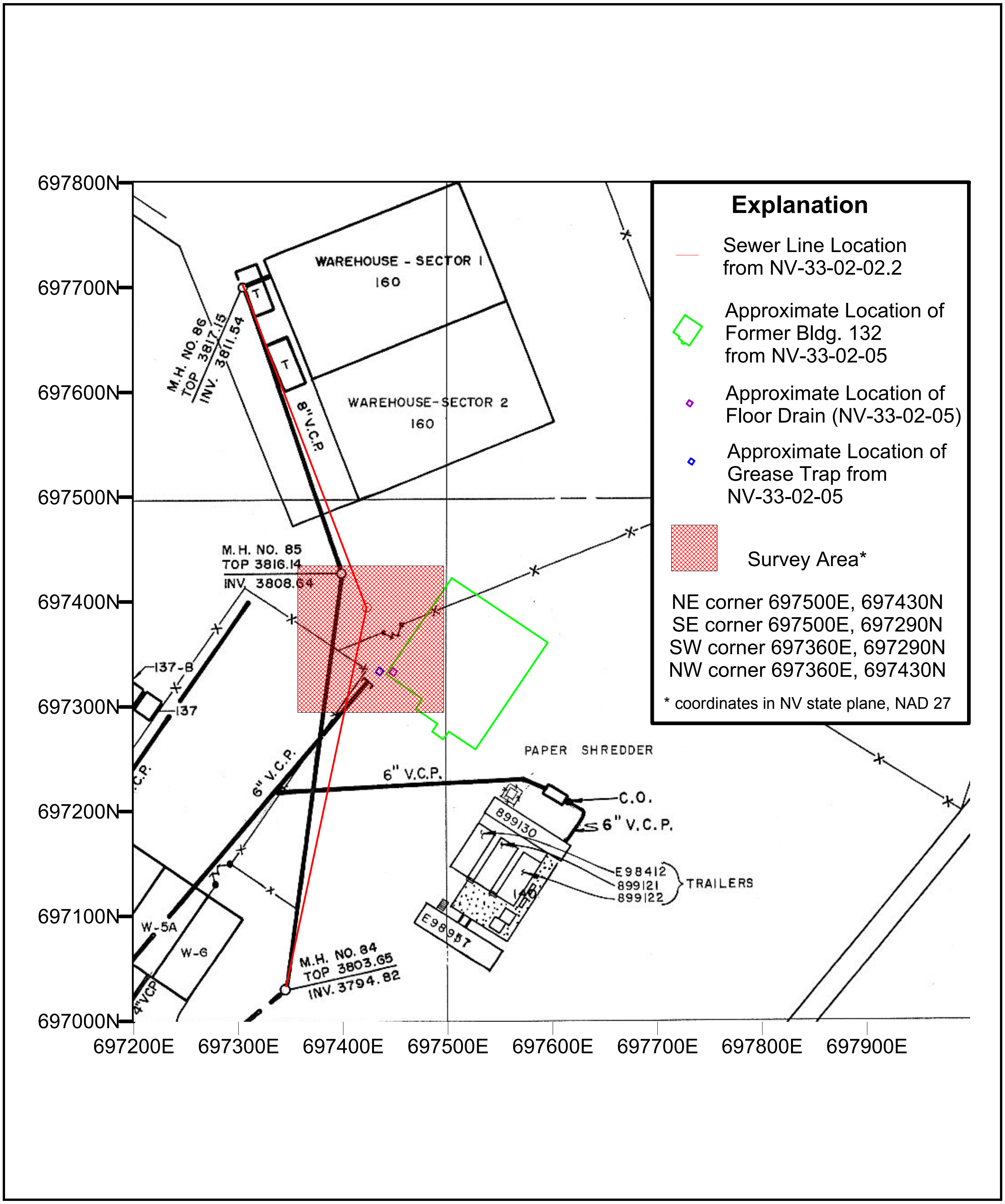

Figure A.2-5
CAS 23-20-02, Injection Well

A.3.0 Step 1 - State the Problem

The problem statement for CAU 219 is: "Existing information on the nature and extent of potential contamination is insufficient to evaluate and recommend corrective action alternatives for the CASs in CAU 219."

A.3.1 Planning Team Members

The DQO planning team consists of representatives from NDEP, NNSA/NSO, SNJV, and BN. The primary decision makers are the NDEP and NNSA/NSO representatives. Table A.3-1 lists representatives from each organization in attendance for the October 28, 2004, DQO meeting.

Table A.3-1
Final DQO Meeting Participants for CAU 219
October 28, 2004

Participant	Affiliation
Greg Raab	Nevada Division of Environmental Protection
Sabine Curtis	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
Brian Hoenes	Stoller-Navarro Joint Venture
David Strand	Stoller-Navarro Joint Venture
Chris Rees	Stoller-Navarro Joint Venture
Jill Dale	Stoller-Navarro Joint Venture
Stacy Alderson	Stoller-Navarro Joint Venture
Julie Snelling-Young	Stoller-Navarro Joint Venture
David Schrock	Stoller-Navarro Joint Venture
Jeanne Wightman	Stoller-Navarro Joint Venture
Jack Ellis	Stoller-Navarro Joint Venture
Alison Urbon	Bechtel Nevada

A.3.2 Conceptual Site Model

The CSM is used to organize and communicate information about site characteristics. It reflects the best interpretation of available information at any point in time. The CSM is a primary vehicle for communicating technical data. It provides a good summary of how and where contaminants are expected to move and what impact such movements may have. It is the basis for assessing how contaminants could reach receptors both in the present and future. The CSM describes the most probable scenario for current conditions at each site and defines the assumptions that are the basis for identifying appropriate sampling strategy and data collection methods. Accurate CSMs are important as they serve as the basis for all subsequent inputs and decisions throughout the DQO process.

The CSM for CAU 219 was developed using information from the physical setting, potential contaminant sources, release information, historical background information, knowledge from similar sites, and physical and chemical properties of the potentially affected media and COPCs. This CSM has been developed to address surface and subsurface features within CAU 219 that may have released contaminants to the adjacent soils through breaches, overflow, and/or intended use. The following sections address the characteristics of the CSM for the DQOs as they apply to the features within CAU 219. Figure A.3-1 is a graphical representation of the CSM.

For CAS 03-11-01, Steam Pipes and Asbestos Tiles, no CSM is applicable since the surface debris at this location will be removed in accordance with a housekeeping work plan.

The CSM for the remaining five CASs consists of:

- Potential contaminant releases including media subsequently affected
- Release mechanisms (the conditions associated with the release)
- Potential contaminant source characteristics including contaminants suspected to be present and contaminant-specific properties
- Site characteristics including physical, topographical, and meteorological information
- Migration pathways and transport mechanisms that describe the potential for migration and where the contamination may be transported

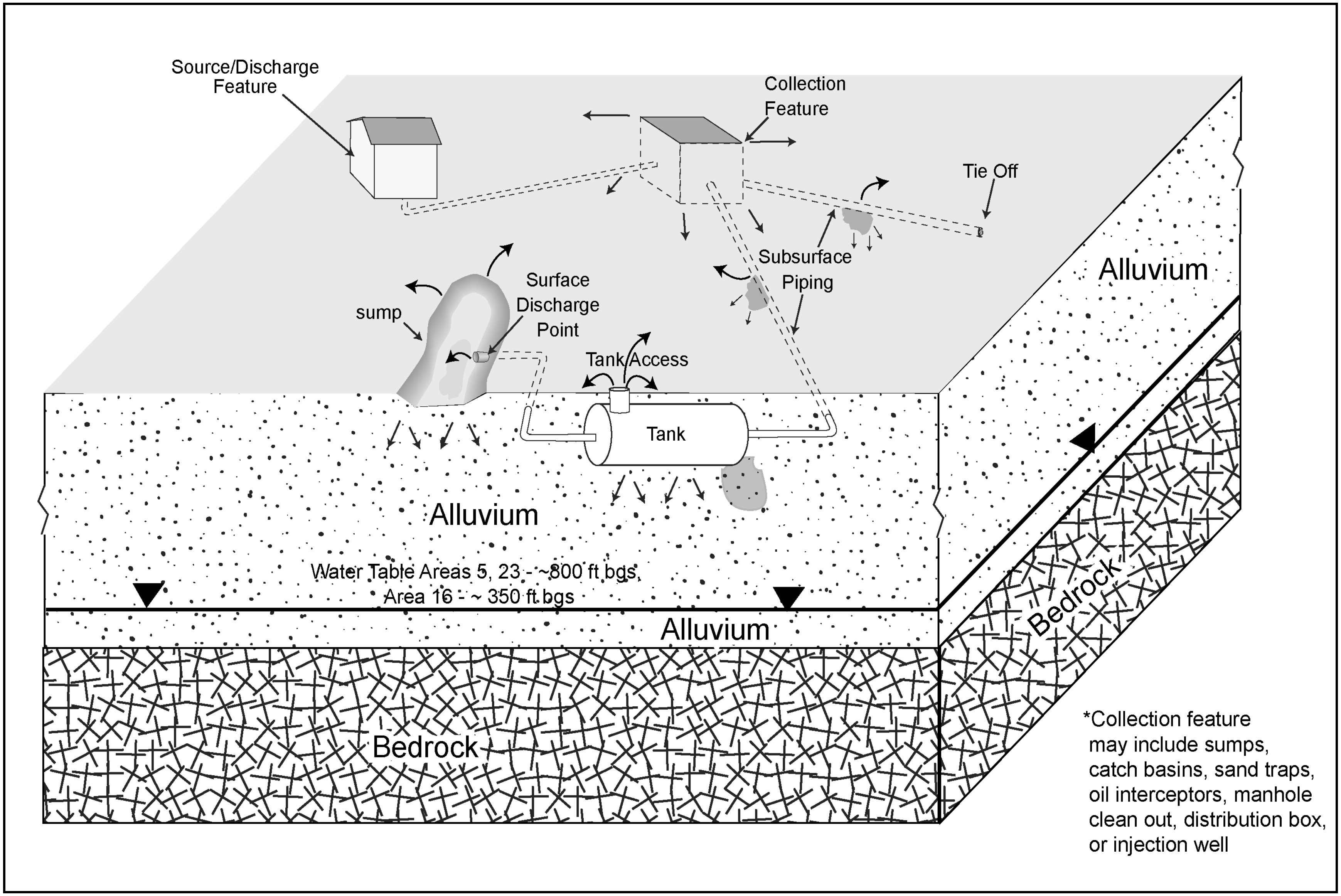

Figure A.3-1
Collection and Distribution Feature CSM

- The locations of points of exposure where individuals or populations may come in contact with a COC
- Routes of exposure where contaminants may contact the receptor

If additional elements are identified during the investigation that are outside the scope of this CSM, the situation will be reviewed and a recommendation will be made as to how to proceed. In such cases, NDEP and NNSA/NSO will be notified and given the opportunity to comment on, or concur with, the recommendation.

The applicability of the CSM to each CAS is summarized in Table A.3-2 and discussed in the following sections. Table A.3-2 provides information on additional CSM elements that will be used throughout the remaining steps of the DQO process.

A.3.2.1 Contaminant Release

The most likely locations of the contamination and releases to the environment are the soils directly below or adjacent to the model's subsurface components (i.e., distribution box, septic tank, subsurface piping, catch basin, grease pit, injection well). This model also accounts for the potential of contaminant overflow from components that are present at the ground surface (e.g., a septic tank cover) and surface discharges. Any contaminants migrating from CASs, regardless of physical or chemical characteristics, are expected to be in soil adjacent to the disposal feature's lateral and vertical soil interfaces.

A.3.2.2 Potential Contaminants

The COPCs for CAU 219 are generally defined as the constituents reported from analyses of Decision I (defined in Section A.4.1) environmental samples collected at each of the CASs. All of the analytes reported from these analytical methods for which the EPA Region 9 has established PRGs (EPA, 2002) or for which toxicity data are listed in the EPA *Integrated Risk Information System* (IRIS) database are considered COPCs (EPA, 2001b). Radiological COPCs are defined as the radionuclides reported from the analytical methods listed in Table A.3-3. The COPCs identified during the planning process through the review of site history, process knowledge, personal interviews, past investigation efforts (where available), and inferred activities associated with the CAS are included in the list. Common contaminants detected at other similar or other NTS sites were

Table A.3-2
Conceptual Site Model
Description of Elements for Each CAS in CAU 219
(Page 1 of 2)

CAU 219 CSM					
CAS Identifier	**16-04-01**	**16-04-02**	**16-04-03**	**23-20-01**	**23-20-02**
CAS Description	**Septic Tanks (3)**	**Distribution Box**	**Sewer Pipes**	**DNA Motor Pool Sewage and Waste System**	**Injection Well**
Site Status	Sites are inactive and/or abandoned				
Future Land Use	Nuclear and High Explosive Test			Reserved	
Sources of Potential Soil Contamination	Surface and subsurface release of chemical and/or sewage containing waste during operations			Surface and subsurface release of wastes used in vehicle maintenance	
Location of Contamination/ Release Point	Soils beneath and immediately adjacent to septic system components and outfall to surface soils have highest potential for releases to the environment			Surface and subsurface soils beneath and immediately adjacent to drains, catch basins, and/or piping have highest potential for releases to the environment	
Amount Released	Unknown; no documented releases				
Affected Media	Surface and shallow subsurface soil; debris such as concrete and metal pipes.				
Target Analytes	None				
Transport Mechanisms	Percolation of precipitation and discharge of liquid wastes through subsurface media serves as the major driving force for migration of contaminants. However, due to the arid environment of the NTS, percolation of precipitation is very small and migration of contaminants has been shown to be limited. Evaporation potentials significantly exceed available soil moisture from precipitation (i.e., 6 to 12 inches) (USGS, 1995a). Surface water run-off may provide for the transportation of some contaminants within or outside of the footprints of the CASs.				
Migration Pathways	Vertically through subsurface soils from surface spills and discharge, and lateral migration through natural drainage channels from overflow of tanks and discharge from collection features onto the surface.				
Lateral and Vertical Extent of Contamination	Unknown. Subsurface contamination plumes, if present, are expected to be contiguous to the release points and concentrations are expected to decrease with distance and depth from the source. Groundwater contamination is not expected. Depth to groundwater in Frenchman Flat (Area 5) is approximately 800 ft bgs, for Area 23 groundwater is approximately 800 ft bgs, and for Area 16 groundwater is approximately 350 ft bgs (Trudeau, 1997; USGS/DOE, 2002). Migration of contamination on ground surface may have occurred as a result of run-off.				

Table A.3-2
Conceptual Site Model
Description of Elements for Each CAS in CAU 219
(Page 2 of 2)

CAU 219 CSM					
CAS Identifier	**16-04-01**	**16-04-02**	**16-04-03**	**23-20-01**	**23-20-02**
CAS Description	**Septic Tanks (3)**	**Distribution Box**	**Sewer Pipes**	**DNA Motor Pool Sewage and Waste System**	**Injection Well**
Exposure Scenario	The potential for exposure to surface contamination is limited to industrial and construction workers, and military personnel conducting training. These human receptors may be exposed to COPCs through oral ingestion, inhalation, dermal contact (absorption) of soil and/or debris due to inadvertent disturbance of these materials or irradiation by radioactive materials.				

also included in the COPC list to reduce the uncertainty about potential contamination at the CASs because complete information regarding activities performed at the CAU 219 sites is not available. Lithium and nickel are identified as COPCs for CAS 23-20-01 due to the batteries stored at the metal battery storage shed. Ethylene glycol is identified as a COPC at CASs 23-20-01 and 23-20-02 due to the contaminants typically associated with vehicle motor pools.

After the review of site history documentation, process knowledge information, personal interviews, and inferred activities associated with the CASs, none of the COPCs were identified as targeted analytes at specific CASs. Targeted analytes are those COPCs for which evidence in the available site and process information suggests that they may be reasonably suspected to be present at a given CAS. The targeted analytes are required to meet a more stringent completeness criteria than other COPCs thus providing greater protection against a decision error (see Section A.3.2). If during the investigation a COPC is identified above PALs, then the analyte will become a targeted analyte and will be subject to the same criteria as those analytes identified for this CAU by each CAS.

Since there are no documented or known releases to the environment at any of the six CASs, no targeted analytes have been identified. However, if at some point during the CAI the existence of any COPC(s) in environmental media is confirmed through analytical methods, then that contaminant(s) will be identified as a target analyte.

Table A.3-3
Analytical Program[a]
(Includes Waste Characterization Analyses)

Analyses[b]	**CAS 03-11-01**	**CASs 16-04-01, 16-04-02, and 16-04-03**	**CAS23-20-01**	**CAS 23-20-02**
Organic Analyses				
TPH (Diesel-Range Organics)	---	X	X	X
TPH (Gasoline-Range Organics)	---	X	X	X
Ethylene Glycol	---	---	X	X
Polychlorinated Biphenyls (PCBs)[e]	---	X	X	X
Semivolatile Organic Compounds[c]	---	X	X	X
Volatile Organic Compounds[c]	---	X	X	X
Inorganic Analyses				
Total *Resource Conservation and Recovery Act* Metals[c]	X[f]	X	X	X
Total Beryllium[e]	---	X	X	X
Total Lithium	---	---	X	---
Total Nickel	---	---	X	---
Radionuclide Analyses				
Gamma Spectrometry[d, e]	X[f]	X	X	X
Waste Characterization Analyses				
Asbestos	X	---	X	---

X - Required analytical method

[a]The contaminants of potential concern are the analytes reported from the analytical methods listed.
[b]If the volume of material is limited, prioritization of the analyses will be necessary.
[c]May also include toxicity characteristic leaching procedure analytes if sample is collected for waste management purposes.
[d]Results of gamma analysis will be used to determine if further radioanalytical analysis is warranted.
[e]Analytical methods are listed for CAU 219 because they are considered to be common NTS concerns.
[f]Verification samples collected below housekeeping waste will be submitted for total RCRA metals and gamma spectrometry only.

* Based on available process knowledge, no target analytes are listed.

Table A.3-4
Analytes for CAU 219

VOC	SVOC	Ethylene Glycol	TPH	PCB	Metals	Radionuclides
1,1,1-Trichloroethane 1,1,1,2-Tetrachloroethane 1,1,2,2-Tetrachloroethane 1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene 1,2-Dichloroethane 1,2-Dichloropropane 1,2,3-Trichloropropane 1,2,4-Trimethylbenzene 1,2-Dibromo-3-chloropropane 1,2-Dibromoethane 1,3,5-Trimethylbenzene cis-1,3-Dichloropropene trans-1,3-Dichloropropene 2-Butanone 2-Chlorotoluene 4-Methyl-2-pentanone Acetone Benzene Bromobenzene Bromochloromethane Bromodichloromethane Bromoform Bromomethane Carbon disulfide Carbon tetrachloride Chlorobenzene Chloroethane Chloroform Chloromethane Dibromochloromethane Dibromomethane Dichlorodifluoromethane Ethylbenzene Isopropylbenzene Iodomethane Methyl tertiary butyl ether Methylene chloride N-Butylbenzene N-Propylbenzene sec-Butylbenzene Styrene tert-Butylbenzene Tetrachloroethene Toluene Trichloroethene Trichlorofluoromethane Trichlorotrifluoroethane Vinyl acetate Vinyl chloride Xylene	1,2,4-Trichlorobenzene[a] 1,2-Dichlorobenzene[a] 1,3-Dichlorobenzene[a] 1,4-Dichlorobenzene[a] 2,4,5-Trichlorophenol 2,4,6-Trichlorophenol 2,4-Dichlorophenol 2,4-Dimethylphenol 2,4-Dinitrophenol 2,4-Dinitrotoluene 2,6-Dinitrotoluene 2-Chloronaphthalene 2-Chlorophenol 2-Methylphenol 2-Nitroaniline 3,3'-Dichlorobenzidine 4-Bromophenyl phenyl ether 4-Chloroaniline 4-Methylphenol 4-Nitrophenol Acenaphthene Acenaphthylene Aniline Anthracene Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(g,h,i)perylene Benzo(k)fluoranthene Benzoic Acid Benzyl Alcohol Bis(2-chloroethoxy) methane Bis(2-chloroethyl)ether Bis(2-chloroisopropyl)ether Bis(2-ethylhexyl) phthalate Butyl benzyl phthalate Carbazole Chrysene Dibenzo(a,h)anthracene Dibenzofuran Diethyl Phthalate Dimethyl Phthalate Di-n-butyl Phthalate Di-n-octyl Phthalate Fluoranthene Fluorene Hexachlorobenzene Hexachlorobutadiene[a] Hexachlorocyclopentadiene Hexachloroethane Indeno(1,2,3-cd)pyrene Isophorone Naphthalene[a] Nitrobenzene N-Nitroso-di-n-propylamine N-Nitrosodiphenylamine Pentachlorophenol Phenanthrene Phenol Pyrene Pyridine	1,2-Dihydroxyethane	Total Petroleum Hydrocarbons (C6 - C38) DRO, GRO	Aroclor-1016 Aroclor-1221 Aroclor-1232 Aroclor-1242 Aroclor-1248 Aroclor-1254 Aroclor-1260	Arsenic Barium Beryllium Cadmium Chromium Lead Lithium Mercury Nickel Selenium Silver	Americium-241 Cesium-137 Cobalt-60 Other parameters: Gamma-emitting radionuclides

[a]May be reported with VOCs

A.3.2.3 Contaminant Characteristics

Contaminant characteristics include, but are not limited to: solubility, density, and adsorption potential. In general, contaminants with low solubility, high affinity for media, and high density can be expected to be found relatively close to release points. Contaminants with small particle size, high solubility, low density, and/or low affinity for media are found further from release points or in low areas where evaporation of ponding will concentrate dissolved constituents.

The solubility and mobility of TPH as a group of organic compounds is dependent upon the type of product released. Diesel oil is slightly soluble and tends to form a viscous layer around soil particles. Gasoline and lighter solvents will be more soluble in percolating infiltration water. This type of product will be less viscous and more prone to vertical migration as a non-aqueous phase liquid.

A.3.2.4 Site Characteristics

Site characteristics are defined by the interaction of physical, topographical, and meteorological attributes and properties. Physical properties include permeability, porosity, hydraulic conductivity, degree of saturation, sorting, chemical composition, and organic content. Topographical and meteorological properties and attributes include slope stability, precipitation frequency and amounts, precipitation run-off pathways, drainage channels and ephemeral streams, and evapotranspiration potential. The site characteristics for the CASs using the Collection and Discharge Feature CSM are as follows:

- CASs 16-04-01, 16-04-02, and 16-04-03 are located in the former Area 16 Camp in an area that the terrain is sloped slightly to the north-northwest. The area is generally disturbed from Camp activities and native vegetation in the area is abundant and overgrown. The CAS orientation is located in a natural, localized drainage area starting at the camp and ending at the down gradient sump to the north-northwest.

- CAS 23-20-01 is located in a flat, graded area. There is no vegetation in the area of the CAS, and there is no evidence of a wash-out or run-off area associated with this CAS.

- CAS 23-20-02 is located in a natural drainage area of Mercury from mountains located to the north and east of the site. The site is slightly sloped to the south-southwest, and has been graded and paved. There is no vegetation present at this CAS location.

A.3.2.5 Migration Pathways And Transport Mechanisms

Migration pathways include the lateral migration of potential contaminants across surface soils and vertical migration into subsurface soils. Percolation and precipitation are typically the driving forces for migration. However, due to the arid environment at the NTS, percolation of precipitation is a small portion of infiltration and migration of contaminants. Evaporation potentials significantly exceed soil moisture from precipitation. However, due to high evapotranspiration (annual potential evapotranspiration at the Area 3 Radiological Waste Management Site has been estimated at 62.6 in. [Shott et al., 1997]) and limited precipitation for this region 6 to 12 in. per year [Winograd and Thordarson, 1975]), percolation of infiltrated precipitation at the NTS does not provide a significant mechanism for vertical migration of contaminants to groundwater (DOE/NV, 1992).

For the CASs within CAU 219, the preferential pathway is expected to be limited to vertical migration due to gravity and the release location, if any, is limited to the shallow subsurface. Lateral migration should also be considered possible at CAS 16-04-01, Septic Tanks (3), and CAS 16-04-03, Sewer Pipes. This lateral migration may be present based on the topography. The CASs are located in the Area 16 Camp in a down-gradient trending location of the camp.

An important element of the CSMs in developing a sampling strategy is the expected fate and transport of contaminants. Fate and transport of contaminants are presented in the CSMs as the migration pathways and transport mechanism that could potentially move the contaminants throughout the various media. Fate and transport are influenced by physical and chemical characteristics of the contaminants and media described in Section A.3.2.3 and Section A.3.2.4.

A.3.2.6 Exposure Scenarios

Human receptors may be exposed to COPCs through oral ingestion, inhalation, dermal contact (absorption) of soil or debris due to disturbance of these materials or irradiation by radioactive materials. The exposure scenarios for sites located within the NTS boundaries are limited by the future land-use scenarios and to site workers who may be exposed to COPCs. The future land-use scenarios for CAU 219 are Nuclear and High Explosive Test Zone and a Reserved Zone (DOE/NV, 1998). Therefore, the potential for exposure to contamination at the CAU 219 CASs is limited to industrial and construction workers as well as military personnel conducting training. The future land-use scenarios for CAU 219 are provided in Table A.3-5.

Table A.3-5
Future Land-Use Scenarios

CAS	Zone	Zone Description
03-11-01, 16-04-01, 16-04-02, 16-04-03	Nuclear and High Explosive Test	This area is designated within the Nuclear Test Zone for additional underground nuclear weapons tests and outdoor high explosives tests. This zone includes compatible defense and nondefense research, development, and testing activities.
23-20-01, 23-20-02	Reserved	This area includes land and facilities that provide widespread flexible support for diverse short-term testing and experimentation. This zone is also used for short duration exercises and training such as nuclear emergency response and Federal Radiological Monitoring and Assessment Center training and DoD land-navigation exercises and training.

Source: (DOE/NV, 1998)

A.4.0 Step 2 - Identify the Decisions

Step 2 of the DQO process identifies the decision statements and defines appropriate alternative actions that may be taken, depending on the answer to the decision statements.

A.4.1 Decision Statements

The problem statement for CAU 219 is: "Existing information on the nature and extent of potential contamination is insufficient to evaluate and recommend corrective action alternatives for the CASs in CAU 219." To address this question, the resolution of two decisions statements is required:

- Decision I: "Is any COPC present in environmental media within the CAS at a concentration exceeding its corresponding action level?" Any contaminant associated with a CAS activity that is present at concentrations exceeding its corresponding action level will be defined as a COC. If a COC is detected, then Decision II must be resolved. Otherwise, the investigation for that CAS is complete.
- Decision II: "If a COC is present, is sufficient information available to evaluate potential corrective action alternatives?" Sufficient information is defined to include:
  - Identification of the volume of media containing any COC bounded by analytical sample results in lateral and vertical directions.
  - Collection of the information needed to characterize IDW for disposal.
  - Collection of the information needed to determine potential remediation waste types.
  - Collection of the information needed to evaluate the feasibility of remediation alternatives (bioassessment if natural attenuation or biodegradation is considered and geotechnical data if construction or evaluation of barriers is considered).

Decision I samples will be submitted to analytical laboratories for the analyses listed in Table A.3-3. Decision II samples will be submitted for the analysis of all COCs identified during Decision I sampling. In addition, samples will be submitted for analyses as needed to support waste management or health and safety decisions.

For CAS 23-20-02, Injection Well, there is insufficient data available to apply the Decision I statement without first determining the existence of this potential release. Therefore, a third decision statement has been established to address the uncertainty of the existence of this CAS:

- Pre-Decision I: "Does the Injection Well identified as CAS 23-20-02 or any remaining features of the well exist?" Investigative methods will be executed in order to determine the existence, location, and current condition of CAS 23-20-02. If physical evidence of the CAS, the feature itself or residual material, is detected, then Decision I will be resolved. Otherwise, the investigation for that CAS is complete.

If sufficient information is not available to evaluate potential corrective action alternatives, site conditions will be re-evaluated and additional samples will be collected (as long as the scope of the investigation is not exceeded and any CSM assumption has not been shown to be incorrect).

A.4.2 Alternative Actions to the Decisions

The actions described in this section may be required to solve the problem based on the outcomes of the investigation.

A.4.2.1 Alternative Actions to Pre-Decision I

If all inputs to the decision fail to identify the former CAS 23-20-02, Injection Well, then it will be determined that the injection well no longer exists and further assessment of the CAS is not required.

A.4.2.2 Alternative Actions to Decision I

If no COC associated with a release from the CAS is detected, further assessment of the CAS is not required.

A.4.2.3 Alternative Actions to Decision II

If sufficient information is available to evaluate potential corrective action alternatives, further assessment of the CAS is not required.

A.5.0 Step 3 - Identify the Inputs to the Decision

This step identifies the information needed, determines sources for information, and identifies sampling and analysis methods that will allow reliable comparisons with action levels.

A.5.1 Information Needs

To resolve the Pre-Decision I (to determine the location of CAS 23-20-02 only), further historical investigation, geophysical surveys, and ground excavation will be necessary to determine the existence and location of this CAS.

To resolve Decision I (to determine if a COC is present at the six CASs), samples need to be collected and analyzed following these two criteria: (1) samples must be collected in areas most likely to contain a COC, and (2) the analytical suite selected must be sufficient to identify any COCs present in the samples.

To resolve Decision II (determine if sufficient information is available to evaluate potential corrective action alternatives at each CAS), samples need to be collected and analyzed to meet the following criteria:

- Samples must be collected in areas contiguous to the contamination but where contaminant concentrations are below action levels.
- Samples of the waste or environmental media must provide sufficient information to characterize the IDW for disposal.
- Samples of the waste or environmental media must provide sufficient information to determine potential remediation waste types.
- The analytical suites selected must be sufficient to detect contaminants at concentrations equal to or less than their corresponding action levels.

A.5.2 Sources of Information

Sources of information to resolve the Pre-Decision I statement for CAS 23-20-02 include extended historical research, geophysical surveys, and ground excavation. Historical research will include locating and review of additional site photos, engineering drawings, geospatial data, and interviews with former employees. Geophysical surveys will be conducted at the location identified through engineering drawings and historical information of former Building 132 (refer to Section A.9.4 for investigation methodology). Ground excavation activities will include potholes and/or excavation of the locations identified during the historical review or features identified in the geophysical surveys.

Information to satisfy Decision I and Decision II will be generated by collecting environmental samples using grab sampling, hand auguring, direct push, backhoe excavation, drilling, and/or other appropriate sampling methods. These samples will be submitted to analytical laboratories meeting the quality criteria stipulated in the Industrial Sites QAPP (NNSA/NV, 2002). Only validated data from analytical laboratories will be used to make these DQO decisions. Sample collection and handling activities will follow standard procedures.

A.5.3 Sample Locations

Decision I samples must be collected at locations most likely to contain a COC, if present. These locations will be selected based on field-screening techniques, biasing factors, the CSM, and existing information. Analytical suites for Decision I samples will include all COPCs identified in Table A.3-3.

Field-screening techniques may be used to select appropriate sampling locations by providing semiquantitative data that can be used to comparatively select samples to be submitted for laboratory analyses from several screening locations. Field screening may also be used for health and safety monitoring and to assist in making certain health and safety decisions. The following field-screening methods may be used to select analytical samples at CAU 219:

- TPHs - a gas chromatograph or equivalent instrument or method may be used to screen for weathered diesel or other heavier carbon chain compounds. The TPH field-screening level (FSL) is established at 75 ppm.
- VOCs - a photoionization detector (PID), or an equivalent instrument or method, will be used to conduct headspace analysis at all CASs because VOCs are a common concern at the NTS and have not been ruled out based upon process knowledge. The VOC FSL is established as 20 ppm or 2.5 times background, whichever is greater.

- Walk-over surface area radiological surveys - a plastic scintillator will be used over approximately 100 percent of the CAS boundaries, as permitted by terrain and field conditions to detect hot spots of radiological contamination.

- Alpha and Beta/Gamma Radiation - an NT Technology Electra, or similar instrument, may be used at all CASs to support waste management, sample transportation, NTS radiological release requirements, and radiological control requirements.

- Fecal coliform samples may be analyzed on site to determine if it is present in the tanks, piping, or distribution box at CASs 16-04-01, 16-04-02, and 16-04-03 for health and safety purposes.

Biasing factors may also be used to select samples to be submitted for laboratory analyses based on existing site information and site conditions discovered during the investigation. The following factors will be considered in selecting locations for analytical samples at CAU 219:

- Documented process knowledge on source and location of release (e.g., volume of release)

- Previous sample or screening results

- Experience and data from investigations of similar sites

- Visual indicators such as discoloration, textural discontinuities, disturbance of native soils, or any other indication of potential contamination

- Presence of debris, waste, or equipment

- Odor

- Physical and chemical characteristics of contaminants

Decision II sample step-out locations will be selected based on the CSM, biasing factors, and existing data. Analytical suites will include those parameters that exceeded action levels (i.e., COCs) in prior samples. Biasing factors to support Decision II sample locations include Decision I biasing factors plus available analytical results.

A.6.0 Step 4, Define the Boundaries of the Study

The purpose of this step is to define the population of interest, define the spatial boundaries, determine practical constraints on data collection, and define the scale of decision making.

A.6.1 Populations of Interest

The population of interest to resolve Decision I ("Is any COPC present in environmental media within the CAS at a concentration exceeding its corresponding action level?") is any single location within the site that is contaminated with any COPC above an action level. The populations of interest to resolve Decision II ("If a COC is present, is sufficient information available to evaluate potential corrective action alternatives?") are:

- Each one of a set of locations bounding contamination in lateral and vertical directions
- IDW or environmental media that must be characterized for disposal
- Potential remediation waste
- Environmental media where natural attenuation or biodegradation or construction/evaluation of barriers is considered

A.6.2 Spatial Boundaries

Spatial boundaries are the maximum lateral and vertical extent of expected contamination at each CAS, as shown in Table A.6-1. Contamination found beyond these boundaries may indicate a flaw in the CSM and would require re-evaluation of the CSM before the investigation could continue. Each CAS is considered geographically independent and intrusive activities are not intended to extend into the boundaries of neighboring CASs.

A.6.3 Practical Constraints

Other NTS activities may affect the ability to investigate this site. Underground utilities may exist at the site, which may limit intrusive sampling locations. Other practical constraints include rough terrain and access restrictions. Access restrictions include scheduling conflicts on the NTS with other entities, areas posted as contamination areas requiring appropriate work controls, physical barriers

Table A.6-1
Spatial Boundaries of CAU 219 CASs

Corrective Action Site	Spatial Boundaries
CAS 03-11-01	Not to exceed 50 ft from any surface debris, on pad or in desert
CASs 16-04-01, 16-04-02, and 16-04-03	Not to exceed 100 ft horizontally or 100 ft from surface drainage; 20 ft vertically
CAS 23-20-01	Not to exceed 50 ft horizontally from buildings slabs or other features; 20 ft vertically below bottom depth of building slabs feature
CAS 23-20-02	Not to exceed 50 ft horizontally or 20 ft vertically from feature

(e.g., fences, buildings, steep slopes), and areas requiring authorized access. Underground utilities surveys will be conducted at each CAS prior to the start of investigation activities to determine if utilities exist, and, if so, determine the limit of spatial boundaries for intrusive activities.

A.6.4 Define the Scale of Decision Making

The scale of decision making in the Pre-Decision I and Decision I is defined as the CAS. Any COC detected at any location within the CAS will cause the determination that the CAS is contaminated and needs further evaluation. The scale of decision making for Decision II is defined as a contiguous area contaminated with any COC originating from the CAS. Resolution of Decision II requires this contiguous area to be bounded laterally and vertically.

A.7.0 Step 5 - Develop a Decision Rule

This step develops a decision rule ("If..., then...") statement that defines the conditions under which possible alternative actions will be chosen. In this step, we establish guidelines for identifying physical features of CAS 23-20-02, specify the statistical parameters that characterizes the population of interest, specify the action levels, confirm that detection limits are capable of detecting action levels, and present decision rules.

A.7.1 Population Parameters

The results of the preliminary investigation (Pre-Decision I) or for a sample representing each population of interest (Decision I and II) defined in Step 4 will be compared to the investigation findings or action levels to determine the appropriate resolution to the Pre-Decision I, Decision I, and Decision II. For the Pre-Decision I statement, the population of interest is the identification of a physical feature (e.g., injection well) for CAS 23-20-02. For the Decision I population of interest, a single analytical sample result above action levels would cause a determination that a COC is present within the CAS. For the Decision II population of interest, a single analytical sample result above action levels would cause a determination that the contamination is not bounded in one direction.

Because this approach does not use a statistical average for comparison to the action levels, but rather a point-by-point comparison, the population parameter for both populations of interest is the observed concentration of each analyte from individual analytical sample results.

A.7.2 Decision Rules

The decision rule applicable to the Pre-Decision I is:

If the strategy to identify the location of CAS 23-20-02 is completed and the result is that no injection well or similar feature is found, then the decision will be made to perform NFA at CAS 23-20-02. Figure A.9-2 provides a flow chart for the actions involved with the Pre-Decision I statement.

The decision rules applicable to both Decision I and Decision II are:

If COC contamination is inconsistent with the CSM or extends beyond the spatial boundaries identified in Section A.6.2, work will be suspended and the investigation strategy will be reconsidered. If COC contamination is consistent with the CSM and is within spatial boundaries, the decision will be to continue sampling to define the extent.

The decision rules for Decision I are:

If the population parameter (the observed concentration of each analyte) of any COPC in the Decision I population of interest (defined in Step 4) exceeds the corresponding action level, that analyte is identified as a COC and Decision II samples will be collected. If all COPC concentrations are less than the corresponding action levels, the decision will be no further action.

The decision rules for Decision II are:

If the population parameter (the observed concentration of any COC) in the Decision II population of interest (defined in Step 4) exceeds the corresponding action level, additional samples will be collected to complete the Decision II evaluation. If all bounding COC concentrations are less than the corresponding action levels, the decision will be that the extent of contamination has been defined in the corresponding lateral and/or vertical direction.

If valid analytical results are available for the waste characterization, bioassessment, and geotechnical samples defined in Section A.9.0, the decision will be that sufficient information exists to characterize the IDW for disposal, determine potential remediation waste types, and to evaluate the feasibility of remediation alternatives.

A.7.3 Action Levels

Because the data collected for the Pre-Decision I statement is based on qualitative measurements and not chemical or radiological analyses, no action levels will be necessary for this decision statement.

The PALs presented in this section are to be used during the Decision I and II sampling for site screening purposes. They are not necessarily intended to be used as cleanup action levels or FALs.

However, they are useful in screening out analytes that are not present in sufficient concentrations to warrant further evaluation; therefore, streamline the consideration of remedial alternatives. The process that will be used to move from PALs to FALs is to:

- Establish FALs that are equal to the PALs
- Establish FALs based on risk to human health and the environment.

The determination of FALs will be documented in the CAU 219 CADD. If FALs are used that are not equal to the PALs, the derivation of the FALs will be presented in an appendix to the CAU 219 CADD.

At a given CAS, each COPC that is detected in a sample at concentrations exceeding the corresponding FAL becomes a COC. The comparison of laboratory results to action levels and the evaluation of potential corrective actions will be included in the CAU 219 CADD.

A.7.3.1 Chemical PALs

Except as noted herein, the chemical PALs are defined as the EPA Region 9 Risk-Based PRGs for chemical constituents in industrial soils (EPA, 2002). Background concentrations for RCRA metals and zinc will be used instead of PRGs when natural background concentrations exceed the PRG, as is often the case with arsenic on the NTS. Background is considered the mean plus two standard deviations of the mean for sediment samples collected by the Nevada Bureau of Mines and Geology throughout the Nevada Test and Training Range (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999). For detected chemical COPCs that are listed in the EPA IRIS database (EPA, 2001b) without established PRGs, the protocol used by the EPA Region 9 in establishing PRGs (or similar) will be used to establish PALs. If used, this process will be documented in the CAU 219 CADD. The specific chemical PALs for CAU 219 are listed in Table 3-3 of the CAIP.

A.7.3.2 Total Petroleum Hydrocarbon PALs

The PAL for TPH is 100 ppm as listed in the NAC 445A.2272 (NAC, 2003).

A.7.3.3 Radionuclide PALs

The PALs for radiological contaminants (other than tritium) are based on the National Council on Radiation Protection and Measurement (NCRP) Report No. 129 recommended screening limits for construction, commercial, industrial land-use scenarios (NCRP, 1999) scaled from 25- to 15-mrem/yr dose constraint and the generic guidelines for residual concentration of radionuclides in DOE Order 5400.5 (DOE, 1993). These PALs are based on the construction, commercial, industrial land-use scenario provided in the guidance and are appropriate for the NTS based on future land-use scenarios as presented in Section A.3.2. The PAL for tritium is based on the UGTA Project limit of 400,000 pCi/L for discharge of water containing tritium to an infiltration basin/area (NNSA/NSO, 2002). The specific radiological PALs for CAU 219 are listed in Table 3-2 of the CAIP.

Solid media such as concrete and/or structures may pose a potential radiological exposure risk to site workers if contaminated. The radiological PAL for solid media will be defined as the unrestricted-release criteria defined in the NV/YMP RadCon Manual (DOE/NV, 2000).

A.7.4 Measurement and Analysis Sensitivity

The measurement and analysis methods listed in the Industrial Sites QAPP (NNSA/NV, 2002) are capable of measuring analyte concentrations at or below the corresponding action levels for each COPC. See Section 6.2.8 of the CAIP for additional details.

A.8.0 Step 6 - Tolerable Limits on Decision Errors

The purpose of this step is to specify performance criteria for the decision rule. Setting tolerable limits on decision errors is neither obvious nor easy. It requires the planning team to weigh the relative effects of threat to human health and the environment, expenditure of resources, and consequences of an incorrect decision. Section 7.1 of the EPA QA/G-4HW guidance (EPA, 2000) states that if judgmental sampling approaches are used, quantitative statements about data quality will be limited to measurement error. Measurement error is influenced by imperfections in the measurement and analysis system. Random and systematic measurement errors are introduced in the measurement process during physical sample collection, sample handling, sample preparation, sample analysis, and data reduction. If measurement errors are not controlled they may lead to errors in making the DQO decisions.

This section provides an assessment of the possible outcomes of DQO decisions and the impact of those outcomes if the decisions are in error.

The baseline condition (i.e., null hypothesis) and alternate condition for the Pre-Decision I statement are:

- Baseline condition - The feature(s) is present.
- Alternative condition - The feature(s) is not present.

The baseline condition (i.e., null hypothesis) and alternative condition for Decision I are:

- Baseline condition - A COC is present.
- Alternative condition - A COC is not present.

The baseline condition (i.e., null hypothesis) and alternative condition for Decision II are as follows:

- Baseline condition - The extent of a COC has not been defined.
- Alternative condition - The extent of a COC has been defined.

Decisions and/or criteria have false rejection (false negative) or false acceptance (false positive) errors associated with their determination. The impact of these decision errors and the methods that will be used to control these errors are discussed in the following subsections. In general terms, confidence in DQO decisions based on judgmental sampling results will be established qualitatively by:

- Development and concurrence of CSMs (based on process knowledge) by stakeholder participants during the DQO process.
- Testing the validity of CSMs based on investigation results.
- Evaluating the quality of the data based on DQI parameters.

A.8.1 False Negative Decision Error

The false negative decision error would mean deciding that a site or a COC is not present when it actually is (Pre-Decision I and Decision I), or deciding that the extent of a COC has been defined when it has not (Decision II). In both cases the potential consequence is an increased risk to human health and environment.

The false negative decision error (where consequences are more severe) is controlled by meeting these criteria:

1. For the Pre-Decision I statement, having a high degree of confidence that a feature consistent with the disposal of motor oil associated with former Building 132 has been identified.
2. For Decision I, having a high degree of confidence that the sample locations selected will identify COCs if present anywhere within the CAS. For Decision II, having a high degree of confidence that the sample locations selected will identify the extent of COCs.
3. Having a high degree of confidence that analyses conducted will be sufficient to detect any COCs present in the samples.
4. Having a high degree of confidence that the dataset is of sufficient quality and completeness.

To satisfy the first criterion for the Pre-Decision I Statement, all steps identified in data needs have been completed. To satisfy the second criterion for sites where the features have been accurately identified, Decision I samples must be collected in areas most likely to be contaminated by COCs (supplemented by random samples where appropriate). Decision II samples must be collected in areas that represent the lateral and vertical extent of contamination (above action levels).

The following characteristics must be considered to control decision errors for the first criterion:

- Source and location of release
- Chemical nature and fate properties
- Physical transport pathways and properties
- Hydrologic drivers

These characteristics were considered during the development of the CSMs and selection of sampling locations. The field-screening methods and biasing factors listed in Section A.5.3 will be used to further ensure that appropriate sampling locations are selected to meet these criteria. Radiological survey instruments and field-screening equipment will be calibrated and checked in accordance with the manufacturer's instructions and approved procedures. The investigation report will present an assessment on the DQI of representativeness that samples were collected from those locations that best represent the populations of interest as defined in Section A.6.1.

To satisfy the third criterion, Decision I samples will be analyzed for the chemical and radiological parameters listed in Section 3.2 of the CAIP. Decision II samples will be analyzed for those chemical and radiological parameters that identified unbounded COCs. The DQI of sensitivity will be assessed for all analytical results to ensure that all sample analyses had measurement sensitivities (detection limits) that were less than or equal to the corresponding PALs. If this criterion is not achieved, the affected data will be assessed (for usability and potential impacts on meeting site characterization objectives) in the investigation report.

To satisfy the fourth criterion, the entire dataset, as well as individual sample results, will be assessed against the DQIs of precision, accuracy, comparability, and completeness as defined in the Industrial Sites QAPP (NNSA/NV, 2002) and in Section 6.2.2 of the CAIP. The DQIs of precision and accuracy will be used to assess overall analytical method performance as well as to assess the need to potentially "flag" (qualify) individual analyte results when corresponding QC sample results are not within the established control limits for precision and accuracy. Data qualified as estimated for reasons of precision or accuracy may be considered to meet the analyte performance criteria based on an assessment of the data. The DQI of completeness will be assessed to ensure that all data needs identified in the DQO have been met. The DQI of comparability will be assessed to ensure that all analytical methods used are equivalent to standard EPA methods so that results will be comparable to regulatory action levels that have been established using those procedures. Site-specific DQIs are discussed in more detail in Section 6.2.2 of the CAIP. Strict adherence to established procedures and QA/QC protocol protects against false negatives. To provide information for the assessment of the DQIs of precision and accuracy, the following quality control samples will be collected as required by the industrial sites QAPP (DOE/NV, 2002):

- Field duplicates (minimum of 1 per matrix per 20 environmental samples)
- Laboratory QC samples (minimum of 1 per matrix per 20 environmental samples)
- Matrix spike/matrix spike duplicate (1 per 20 environmental samples or 1 per CAS per matrix, if less than 20 collected, as required by the analytical methods)

A.8.2 False Positive Decision Error

The false positive (beta) decision error would mean deciding that an injection well is present when it is not, a COC is present when it is not, or a COC is unbounded when it is not, resulting in increased costs for unnecessary sampling and analysis.

The false positive decision error is controlled by implementing all the controls that protect against false positive decision errors. False positive results are typically attributed to laboratory and/or sampling/handling errors that could cause cross contamination. To control against cross contamination, decontamination of sampling equipment will be conducted according to established and approved procedures and only clean sample containers will be used. To determine if a false positive analytical result may have occurred, the following quality control samples will be collected as required by the Industrial Sites QAPP (DOE/NV, 2002):

- Trip blanks (one per sample cooler containing VOC environmental samples)
- Equipment blanks (one per sampling event for each type of decontamination procedure)
- Source blanks (one per source lot per sampling event)
- Field blanks (minimum of one per CAS - additional if field conditions change)

A.9.0 Step 7 - Optimize the Design for Obtaining Data

This section provides the general approach for obtaining the information necessary to resolve Pre-Decision I, Decision I, and Decision II. A judgmental (nonprobabilistic) sampling scheme will be implemented to select sample locations and evaluate analytical results. Judgmental sampling allows the methodical selection of sample locations that target the populations of interest (defined in Step 4) rather than nonselective random locations. Random sample locations are used to generate average contaminant concentrations that estimate the true average ("characteristic") contaminant concentration of the site to some specified degree of confidence.

Since individual sample results, rather than an average concentration, will be used to compare to action levels, statistical methods to generate site characteristics will not be necessary. Section 0.4.4 of the EPA *Data Quality Objectives for Hazardous Waste Site Investigations* (EPA, 2000) guidance states that the use of statistical methods may not be warranted by program guidelines or site-specific sampling objectives. The need for statistical methods is dependent upon the decisions being made. Section 7.1 of the EPA QA/G-4HW guidance states that a nonprobabilistic (judgmental) sampling design is developed when there is sufficient information on the contamination sources and history to develop a valid CSM and to select specific sampling locations. This design is used to confirm the existence of contamination at specific locations and provide information (such as extent of contamination) about specific areas of the site.

All sample locations will be selected to satisfy the DQI of representativeness in that samples collected will best represent the populations of interest as defined in Section A.6.1. To meet this criterion, a biased sampling strategy will be used for Decision I to target areas with the highest potential for contamination, if it is present anywhere in the CAS. Sample locations will be determined based on process knowledge, previously acquired data, or the field screening and biasing factors listed in Section A.5.3. If biasing factors are present in soils below locations where Decision I samples were removed, additional Decision I soil samples will be collected at depth intervals selected by the Site Supervisor based on biasing factors to a depth where the biasing factors are no longer present. The Site Supervisor has the discretion to modify the sample locations, but only if the modified locations meet the decision needs and criteria stipulated in this DQO.

To meet the DQI of representativeness for step-out (Decision II) samples (that Decision II sample locations represent the population of interest as defined in Section A.6.1), sampling locations at each CAS will be selected based on the outer boundary sample locations where COCs were detected, the CSM, and other field screening and biasing factors listed in Section A.5.3. In general, sample locations will be arranged in a triangular pattern around the Decision I location at distances based on site conditions, process knowledge, and biasing factors. If COCs extend beyond the initial step-outs, Decision II samples will be collected from incremental step-outs. Initial step-outs will be at least as deep as the vertical extent of contamination defined at the Decision I location and the depth of the incremental step-outs will be based on the deepest contamination observed at all locations. A clean sample (i.e., COCs less than action levels) collected from each step-out direction (lateral or vertical) will define extent of contamination in that direction. The number, location, and spacing of step-outs may be modified by the Site Supervisor, as warranted by site conditions.

The following sections discuss CAS-specific investigation activities, including proposed sample locations. As the sampling strategy for each CAS is developed, specific biasing factors will be described. In the absence of biasing factors, samples will be collected from the default sampling locations described for each CAS.

A.9.1 CAS 03-11-01, Steam Pipes and Asbestos Tiles

This section discusses the sampling and analysis design for CAS 03-11-01. Housekeeping debris comprise the components of this CAS. The debris consists of four individual pieces of steam piping wrapped in fiberglass-like insulation, a 15-ft rubber hose attached to one pipe, and floor tiles. As best management practice, the debris will be removed from the CAS in accordance with a housekeeping work plan. Due to the nature of the debris and the lack of a known contaminant source, removal of material underlying the debris (e.g., soil or concrete) is not expected. The following housekeeping activities will be conducted at this CAS for site closure:

- If there is residual material identified inside any of the pipes or the hose, that media will be sampled for waste management purposes. If no residual material is present, the pipes and hose will be disposed as solid or salvageable waste.
- The debris will be radiologically surveyed and a copy of the results will be maintained in the project files. Results of the survey will be reported in the CADD and/or closure report.

- The floor tiles located on the concrete pad and ground surface were previously sampled and determined to be 10 to 20 percent asbestos-containing material. The tiles will be handled and disposed as asbestos-containing material. No additional waste characterization samples are required.
- A minimum of one soil sample will be collected from below each piece of pipe for verification in accordance with housekeeping closure requirements and submitted for RCRA metals and gamma spectrometry analysis. Verification samples of material underlying floor tiles is not required.
- Before and after photographs of the site will be taken, as well as GPS points will be taken for each area where debris is removed.
- A Site Closure Verification Form will be completed for the site. Proper waste documentation, as appropriate, will be completed. Photographs, the closure verification form, and appropriate waste documentation will be included in the corrective action decision document to document proper closure of this CAS.

If verification samples detect the presence of COCs underlying the debris, the investigation will be expanded to delineate the extent of contamination under Decision II protocol (i.e., step-out sampling). If less than 30 cubic yards of soil are impacted by contamination, the soil can be removed under housekeeping activities. Alternatively, if impacted soil is greater than 30 cubic yards, other site closure alternatives will be evaluated.

A.9.2 CAS 16-04-01, Septic Tanks (3); CAS 16-04-02, Distribution Box; and CAS 16-04-03, Sewer Pipes

This section discusses the sampling and analysis design for the septic system composed of the following three CASs:

- 16-04-01, Septic Tanks
- 16-04-02, Distribution Box
- 16-04-03, Sewer Pipes

These CASs are combined for discussion of investigation activities because all the CASs are part of the same septic system. If effluent contaminated one of these system components, the potential exists that all three CASs are impacted by the same release(s). Because these components comprise a system, the Decision I and Decision II samples will be representative of one or more of the CASs.

Proposed Decision I sample locations for the septic system components are identified in Figure A.9-1. The proposed locations are biased to areas most likely to be impacted by COCs based on process knowledge, historical information, and the characterization of similar sites. A minimum of one subsurface sample will be collected from the base of distribution box at the inlet pipe, south of the three tanks. A minimum of four surface soil samples will be collected immediately adjacent to each of the three tanks to account for the potential of COCs that may have leaked into the surrounding soils through the tank access covers as a result of tank overflow(s). A minimum of six subsurface soil samples will be collected from immediately beneath each inlet and outlet pipes of the three-tank system and one subsurface soil location at the outlet pipe junction to the north of the tanks which will be representative of potential leaks to the environment at those seven locations. To investigate potential releases at the outfall and into the sump at the northernmost region of the CAS, surface soil and subsurface soil samples at the native soil interface will be collected at the proximal (location of outfall pipe), low-point, and distal locations within the sump. The depth of native soil will be determined at the time of sampling in the field.

Lastly, two surface samples will be collected within the drainage channel up gradient of the sump outfall and down gradient of the distal end of the sump, to identify any contamination that may have resulted from overflow(s) of the sump. These two sample results can also be used to support Decision II.

A video survey will be performed to verify the integrity of the piping and access points (e.g., manholes, tie-ins) near the distribution box and septic tanks. If breaches are identified within the piping, Decision I samples will be collected for analysis via excavation to access the breach. An inspection of the piping extending from the Area 16 camp to the beginning of the septic system will not be necessary unless COCs are identified from Decision I sampling. The septic tanks and distribution box will be opened at surface access points, if present, and residual materials will be sampled for waste management purposes. If access points are not present on the surface, excavation will be conducted to uncover the tank to gain access for inspection and sampling, if necessary.

A.9.3 CAS 23-20-01, DNA Motor Pool Sewage and Waste System

To address the potential for soil contamination as a result of contaminated run-off, a minimum of six Decision I surface samples will be collected for laboratory analysis from the surface soils surrounding

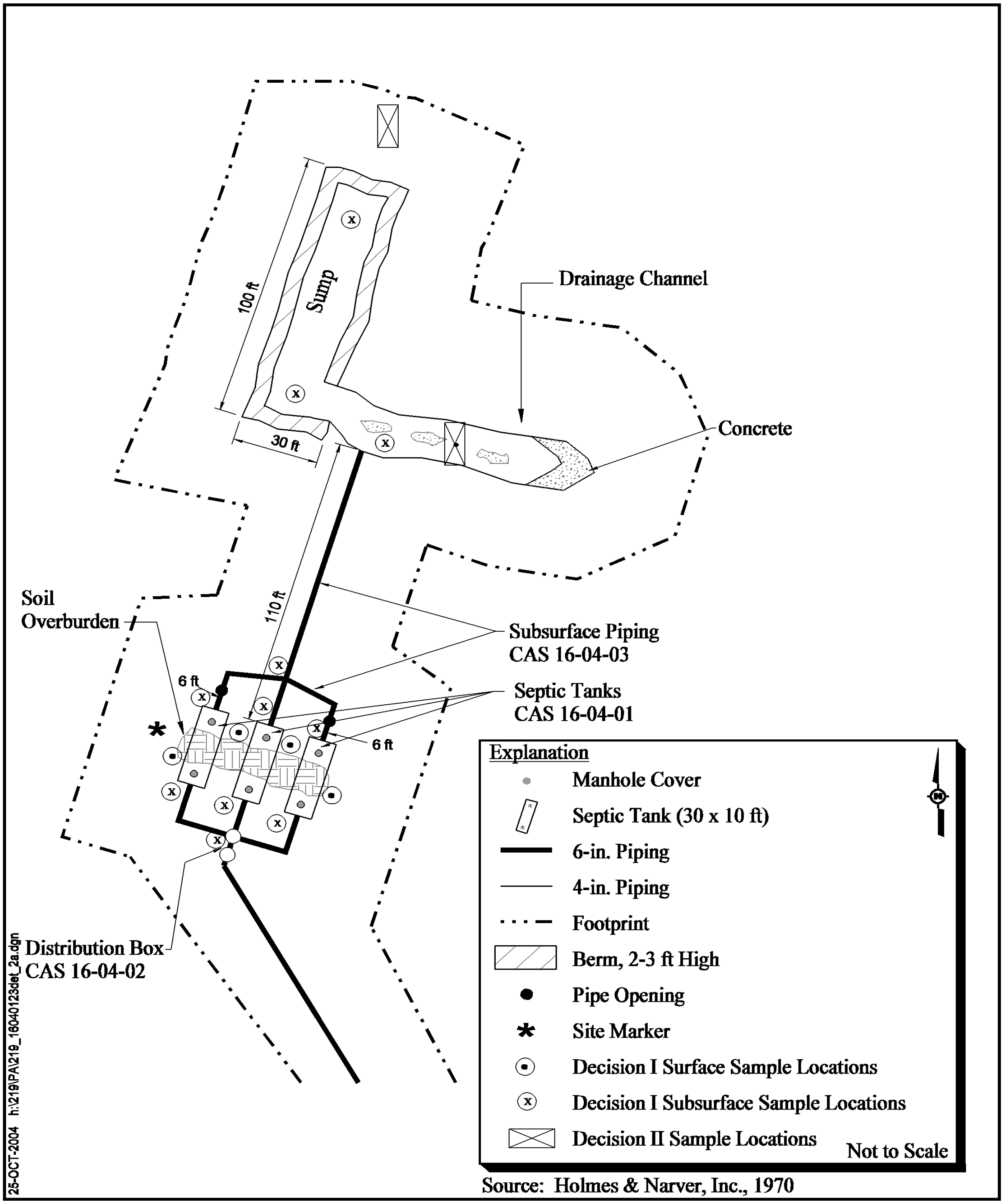

Figure A.9-1
CASs 16-04-01, 16-04-02, and 16-04-03 Sample Locations

the perimeter of the three concrete foundations (Building 210, decontamination pad, and metal shed). The proposed locations are depicted on Figure A.9-2; however, the number of samples may be increased and/or the locations may be modified in the field based on biasing factors (e.g., staining, preferential pathway) and field conditions (e.g., utility lines).

The integrity of the concrete building foundation, the decontamination pad, and the metal shed will be documented. If significant cracks or breaks are identified in the concrete floors of any of these features that expose the underlying soil, a sample will be collected from below the pad at the point of exposure under the assumption the exposure point may act as a preferential pathway to subsurface soils. The concrete will be scabbled and sampled at visibly stained areas for waste management purposes.

Prior to Decision I sampling of the Building 210 collection/distribution system, surface access points (e.g., manholes, drains, clean-outs) within the system will be uncovered. If residual materials (e.g., soil/sludge) are identified within these features, a sample will be collected at each access point and submitted for analysis to identify potential COCs that may have been released downstream through the distribution piping. This assumes that contaminants, if present, will most likely be near the source of release (e.g., a grease pit or drain). Figure A.9-2 depicts the proposed sample locations based on historical process information and current conditions in the field.

Using the open access points, a video mole survey will be performed on the adjacent subsurface piping to verify piping integrity, identify breaks, residual materials, and unknown tie-ins. If obstructions/breaches are encountered within the piping, a backhoe will be used to expose the obstruction or breach and a sample will be collected from any residual media at the discretion of the Site Supervisor. Either the video mole survey or excavation will be used to verify that the inactive piping is blocked or grouted at the juncture of the Building 211 active line to prevent unauthorized releases to the active system.

Decision I samples will be collected at biased locations directly beneath collection system points to determine if potentially contaminated effluent may have leaked or overflowed from the system component into surrounding subsurface soils. The base or bottom of collection system components represent the most likely area for potential contaminants to migrate into surrounding soils due to breaches in the structure(s). The following collection points associated with the former Building 210

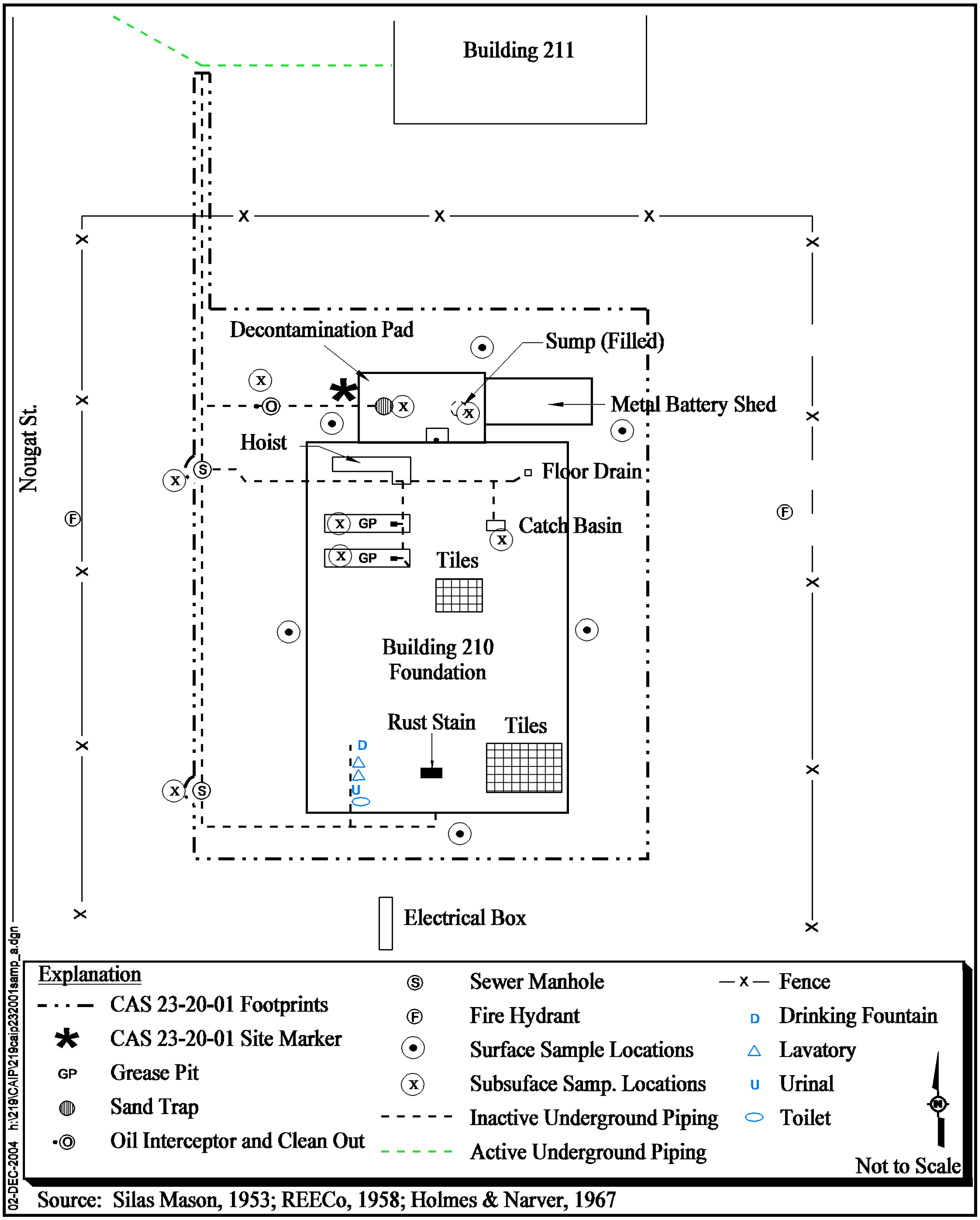

Figure A.9-2
CAS 23-20-01 Sample Locations

and the decontamination pad will have a minimum of one subsurface sample location accessed via excavation (or other appropriate method) to collect a minimum of two subsurface samples for laboratory analysis: each grease pit (2), the catch basin, the concrete-filled sump, the oil interceptor, and the sand trap. Figure A.9-2 shows the proposed sample locations at each of these components. If additional waste collection features are identified in the field, sample locations will be added to address the potential for breached integrity of that feature.

A.9.4 CAS 23-20-02, Injection Well

In order to initiate and execute a comprehensive and appropriate Decision I or II sampling scheme at CAS 23-20-02, the exact location of the CAS must be determined and an assessment of its true physical attributes must first be made. Former Building 132, which is believed to have been the source of effluent for this CAS, was demolished in 1965 and there is no indication of an injection well associated with the former building in the vicinity that is noticeable from site visits or interviews. However, engineering drawings indicate that a collection or disposal feature associated with the old Building 132 Motor Pool may have existed in the area that was once west of this building, now near the access road to the south side of the Building 160 Warehouse.

An area south of Building 160 Warehouse has been identified as the area most likely to contain the injection well. In order to have a high degree of confidence that the feature will be found, the following methodology will be implemented in an attempt to physically locate this CAS.

Additional historical research, review of engineering drawings, and interviews have been conducted and an area has been identified as potentially containing the CAS in the shallow subsurface:

- Step 1; An area of approximately 120 x 140 ft will undergo comprehensive geophysical surveys and will include, but are not limited to: Ground Penetrating Radar, EM-31 and EM-61 surveys (see Figure A.2-5). If an anomaly or subsurface feature is identified from these surveys with a high probability of being the feature of interest, Step 2 will be initiated. If the feature is not identified, then it will be determined that the injection well no longer exists and further assessment of the CAS is not required and a decision for NFA will be made.

- Step 2; The area will be excavated or trenched in order to expose the feature for visual inspection by the project staff, barring any safety restrictions that may be enforced due to other active subsurface utilities in the area. If an injection well or similar waste collection system is identified, then Decision I sampling strategy will be executed, in accordance with the instructions below.

The investigative strategy for resolving Pre-Decision I is depicted in Figure A.9-3.

Upon identification of the injection well location and configuration, Decision I samples will be collected from soil within and/or surrounding the injection well. The initial sample locations will be determined in the field based on the configuration of the injection well, biasing factors encountered during the initial investigation, and field conditions (i.e., utility lines). An appropriate sampling method will be implemented (e.g., backhoe, drill rig) to access sample locations based on the configuration of the injection well and specific sampling needs. Prior to proceeding with Decision I sampling, the sample locations will be presented to NDEP for concurrence.

If the results exceed the PALs, Decision II samples will be necessary to determine the lateral and vertical extent of the contamination. Decision II samples will be collected based on field conditions related to the Decision I samples and data received from those Decision I samples. Lateral and vertical samples will be collected at an appropriate distance from the original location based on field conditions. The results of these samples will determine if the contamination has been bounded.

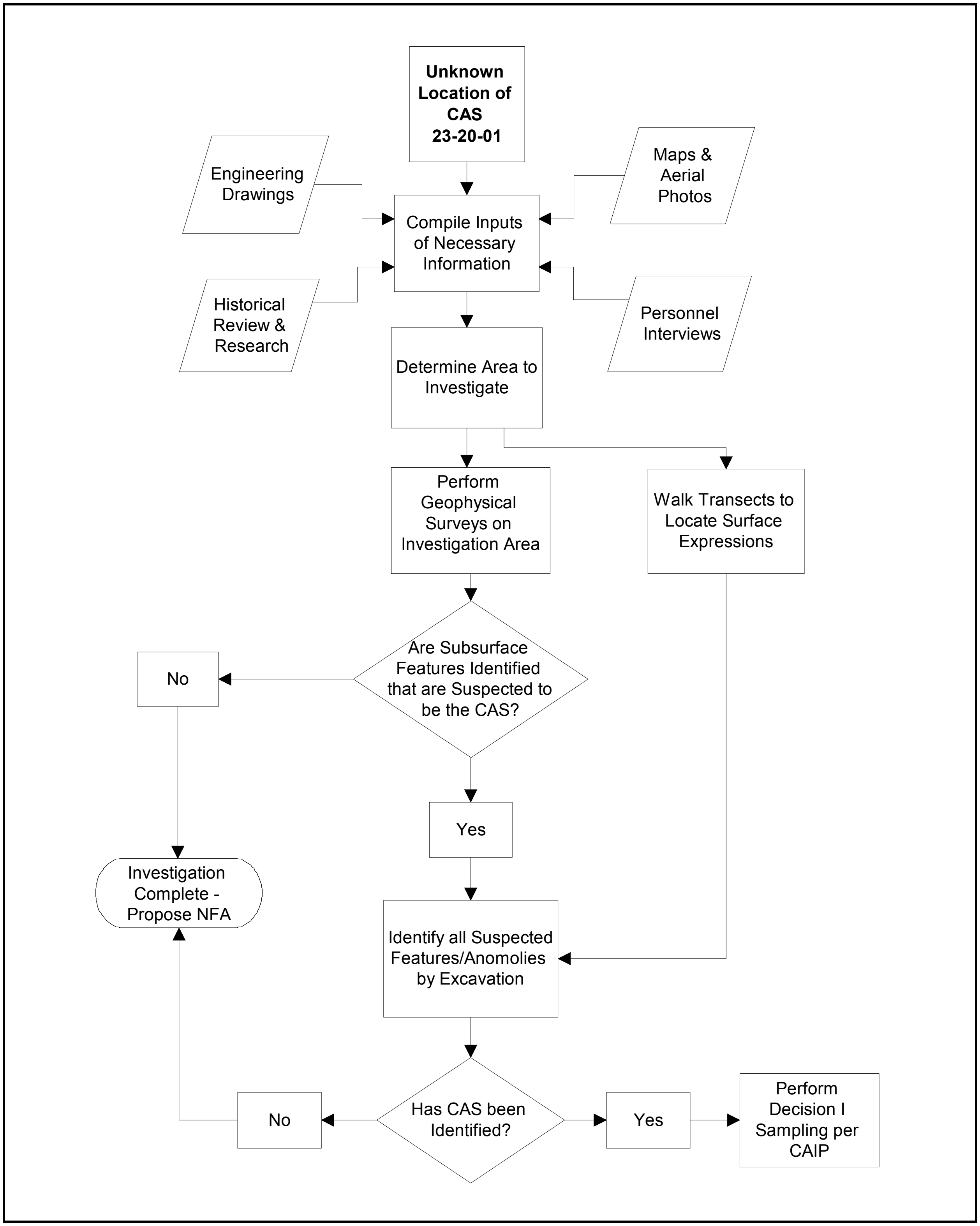

Figure A.9-3
CAS 23-20-02 Pre-Decision I Strategy

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Appendix B

Project Organization

B.1.0 Project Organization

The NNSA/NSO Project Manager is Janet Appenzeller-Wing and she can be contacted at (702) 295-0461. The NNSA/NSO Task Manager is Sabine Curtis, and she can be contacted at (702) 295-0542.

The identification of the project Health and Safety Officer and the Quality Assurance Officer can be found in the appropriate plan. However, personnel are subject to change and it is suggested that the appropriate DOE or Defense Threat Reduction Agency Project Manager be contacted for further information. The Task Manager will be identified in the FFACO Monthly Activity Report Prior to the start of field activities.

Appendix C

NDEP Comment Responses

NEVADA ENVIRONMENTAL RESTORATION PROJECT
DOCUMENT REVIEW SHEET

1. Document Title/Number: Corrective Action Investigation Plan for Corrective Action Unit 219: Septic Systems and Injection Wells, Nevada Test Site	2. Document Date: December 6, 2004
3. Revision Number: 0	4. Originator/Organization: Stoller Navarro Joint Venture
5. Responsible NNSA/NSO ERP Project Mgr.: Janet Appenzeller-Wing	6. Date Comments Due: December 27, 2004
7. Review Criteria: Full	
8. Reviewer/Organization/Phone No.: Greg Raab, NDEP, 486-2867	9. Reviewer's Signature:

10. Comment Number/ Location	11. Type*	12. Comment	13. Comment Response	14. Accept
1) Pg. 47, sec. 6.2.5, last sentence	M	"The assessment of this qualitative criterion will be presented in the investigation report." Please identify the investigation report.	The words "investigation report" have been replaced with "CAU 219 CADD."	Y
2) Pg. 47, sec. 6.2.6, last sentence	M	"This assessment will be based on meeting the data needs identified in the DQOs and will be presented in the investigation report." The portion "...data needs identified..." is nonsensical and must be re-written. Please identify the investigation report.	The word "needs" has been replaced with "requirements." The words "investigation report" have been replaced with "CAU 219 CADD."	Y
3) Pg. A-33, sec. A.7.3, second paragraph, first sentence	M	"The determination of FALs will be documented in the investigation report." Please identify the investigation report.	The words "investigation report" have been replaced with "CAU 219 CADD."	Y
4) Pg. A-33, sec. A.7.3, third paragraph, last sentence	M	"...the evaluation of potential corrective actions will be included in the investigation report." Please identify the investigation report.	The words "investigation report" have been replaced with "CAU 219 CADD."	Y
5) Pg. A-33, sec. A.7.3.1, first paragraph, second to last sentence	M	"If used, this process will be documented in the investigation report." Please identify the investigation report.	The words "investigation report" have been replaced with "CAU 219 CADD."	Y

[a] Comment Types: M = Mandatory, S = Suggested.
Return Document Review Sheets to NNSA/NV Environmental Restoration Division, Attn: QAC, M/S 505.

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